XVI.—*Results of Thermometrical Observations made at* Sir Edward Parry's *several Wintering-Places on his Arctic Voyages, and at Fort Franklin.* By Dr. Richardson, F.R.S. &c., Physician to Haslar Hospital.

The Transactions of the Royal Society of Edinburgh for 1826 contain Sir David Brewster's discussions of an hourly register of the temperature at Leith Fort, kept for two years (1824 and 1825), from whence he deduced,

1. The form and character of the mean daily curve for each month, season, and the entire year; and the mean temperature of the same periods.
2. The two times of the day when the mean temperature occurs.
3. The relation between the mean temperature of the 24 hours, and that of any single hour, or pair of similar hours.
4. The average daily range for each month.
5. The parabolic form of the branches of the annual daily curve.

The results of this paper appeared to be of such importance, that the Mathematical Committee of the British Association for the Advancement of Science on their first meeting at York, recommended a similar register to be kept in the south of England, remarking that "we want nothing but the combination of a sufficient number of trustworthy observations, in order to obtain results of primary importance to science, and which may one day enable us to arrive at the true form of the daily and annual curves of mean temperature, with a precision almost mathematical. In order, however, to extend the benefit of such investigations, it is absolutely necessary that they should be pursued in different latitudes." (p. 43.) This recommendation was ably acted upon at Plymouth by Mr. Snow Harris, and the fifth report of the Association contains two years' hourly observations at Plymouth Dock, arranged and discussed by him according to Sir David Brewster's method.

Convinced of the importance of investigating the phenomena of diurnal temperature in various latitudes, I have thought that a discussion of the thermometrical observations made on Sir Edward Parry's several voyages would be a service rendered to science. Though this task involved a very considerable sacrifice of time, I was induced to undertake it from a knowledge of the great accuracy with which the temperatures were registered on the arctic voyages, and a full persuasion that the results would adequately repay the labour required. It is true that the observations were made at intervals of two hours instead of hourly, and that the ships being generally under way for almost two

months out of the twelve, varied their latitudes more or less in that time,* but many years are likely to elapse before equally extensive and accurate registers are kept in these high latitudes, notwithstanding that drawback.

The inaccuracy of most, if not of all thermometers made in England for very low temperatures, and particularly the discordance between the mercurial and spirit thermometers at temperatures below zero, are sources of error affecting materially all winter observations in the high latitudes. On comparing 12 thermometers, made by London artisans of high repute, by hanging them side by side in the open air at Fort Franklin for many days, I found that at + 32° they stood within half a degree of each other, but when the temperature sunk to 40° below zero, they differed widely,—the two extreme ones as much as 10°; those giving mean indications were of course selected for use. The subjoined note † will show that the difference between mercurial and spirit thermometers is well known though not remedied.

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* During the navigation of Lancaster Strait or Hudson's Bay, the temperature is likely to be more or less frequently influenced by masses of ice drifting with the southerly current from higher latitudes, yet this is in some measure compensated by the ice generated on the spot being carried off by the same current.

† "M. Flauguerges, of Viviers, compared with peculiar care and attention a spirit of wine thermometer, constructed under the eye of Réaumur, with mercurial octogesimal ones made by the best modern artists. The experiments were often repeated with the following results:—

Spirit of Wine.	Mercurial.	Spirit of Wine.	Mercurial.
+80·0	+66·8	0·0	0·0
75·6	63·5	− 3·5	− 3·4
56·¼	49·6	− 5·0	− 4·9
32·7	29·8	−12·7	−12·4
13·8	12·7	−17·4	−16·6
10·5	9·6	(*Ed. Journ. of Science*, i. p. 374."	

"Dr. Wildt, of Hanover, made the following observations on thermometers, also divided by Réaumur's scale:—

Spirit of Wine.	Mercurial.	Spirit of Wine.	Mercurial.
+80·00	+80	+ 7·95	+10
73·90	75	3·90	5
67·95	70	0·00	0
62·14	65	− 3·75	− 5
56·48	60	7·36	10
50·97	55	10·82	15
45·60	50	14·13	20
40·38	45	17·30	25
35·31	40	20·32	30
30.38	35	23·19	35
25·60	30	25·92	40
20·97	25	28·50	45
16·48	20	*Ed. New Phil. Journ. for*	
12·14	15	1826, p. 327."	

Sir Edward Parry says, "we found, on comparing ten thermometers, (of which three were mercurial and seven of alcohol,) a difference of no less than 7½° between them, their indications ranging between −22·5°, and −30°. At higher temperatures the difference was inconsiderable."—(*Second Voy.*, p. 132.)

Sir Edward Parry's thermometrical registers were obtained from the Admiralty, on application to Captain Beaufort, the Hydrographer. In ascertaining the sums of the temperatures for each hour of the month, I had the assistance of Serjeant Drake, Clerk of Melville Hospital, the sums being calculated both by him and myself separately, and the results compared. All the subsequent calculations were made entirely by myself, and I endeavoured by a variety of cross checks, to avoid the errors which might otherwise have crept in, as the arithmetical operations, though of the simplest nature, were necessarily very numerous and tedious. In deducing the curves of the seasons or years, the error which would have arisen from the unequal lengths of the months, had their mean temperatures been used, was obviated by dividing the sums of all the temperatures for each hour of the period by the number of days. In like manner the mean temperature of each month and of the whole year was always obtained by dividing the gross sum of the recorded temperatures for these periods by the number of observations. Throughout the paper the model furnished by Sir David Brewster has been followed as strictly as circumstances would admit.

Section I.

Observations at Melville Island.

The following tables are the results of registers of temperatures recorded every 2 hours, for an entire year at Melville Island. Two independent registers were kept;—one on board the *Hecla*, Captain Parry, and the other in the *Griper*, Lieutenant Liddon. Table I. contains the daily and monthly mean temperatures from the Hecla's register; Table II. the sums and monthly means from the *Griper's* journal, for the purpose of comparison. Tables III., IV., and V. are entirely from the latter. The registers commence with September and end with August; and the ships were stationary in Winter Harbour from the 5th of September till the 1st of August. Winter Harbour is situated in lat. 74° 47′ N., long. 110° 48′ W. In the four first days of September the ships in sailing to the westward from long. 107° 14′ to 110° 50′, had varied their latitude only 11 miles, or from 74° 58′ to 74° 47′ N. August was mostly occupied in endeavouring to sail along Melville Island, the greatest departure westward from Winter Harbour being 3° of longitude: the difference of latitude from that of Winter Harbour throughout the month, was from 10 to 20 miles, except in the three or four last days, when the ships on their return sailed from lat. 75° to 74° 02′, the latter position

being 45 miles south of Winter Island, and the greatest departure in the whole year from the parallel of the usual place of observation. The ground was covered with snow from September till towards the end of May, when patches of soil began to appear and pools of water to form, and on the 24th of that month there was a smart shower of rain: but even late in June there was much snow lying in the valleys of the interior. The ships when at sea during the time embraced by the register, were always surrounded by masses of floating ice—and Sir Edward Parry remarks that, "In the whole of the steep coast (of Melville Island) whenever we approached the shore, we found a thick stratum of blue and solid ice, firmly imbedded in the beach, at the depth of from 6 to 10 feet under the surface of the water." This ice he suggests, "has probably been the lower part of heavy masses forced aground by the pressure of floes from without, and still adhering to the viscous mud of which the beach is composed, after the upper part has in course of time dissolved." But it may have been a protruding stratum of frozen soil containing much water, laid bare by the friction of the floating masses of ice, and this is the more probable from the observation which follows:—"From the tops of the hills in this part of Melville Island a continuous line of this sub-marine ice could be distinctly traced for miles along the coast."—*Parry's Voy. of Disc.*, p. 235.

By calculation, excluding the effects of refraction, the sun ought to have been below the horizon for 96 days at the winter solstice, or from the 4th of November till the 8th of February, but its upper limb was actually seen from the mast head on the 11th of November, and it was again seen from the maintop on the 3rd of February, the actual period of its absence having been only 84 days. On the 1st of May it was seen at midnight from the high grounds, giving, for its continuance above the horizon about the summer solstice, a period of 104 days.

The temperatures were registered on board the ships, but Sir Edward Parry observes, that "by a register which was kept by Captain Sabine at the Observatory, it was found that the thermometer invariably stood at least from 2° to 5°, and on one or two occasions, as much as 7° higher on the outside of the ships than it did on shore, owing probably to a warm atmosphere, created by the constant fires kept on board." The temperatures shown by thermometers at the ships are used in the tables without correction.

TABLE I.—Containing the daily and monthly mean temperatures for one year (1819-20), deduced from observations made every two hours on board the Hecla, at Melville Island. Lat. 74° 47′ N.

Day.	1819.				1820.							
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	August.
	°	°	°	°	°	°	°	°	°	°	°	°
1	+33·00	+ 6·83	− 1·00	−30·29	−18·33	−20·87	−31·33	− 6·33	+ 8·58	+36·29	+40·58	+36·21
2	32·79	+12·83	+ 3·25	32·96	24·58	31·75	25·00	− 8·37	6·25	34·17	40·50	34·17
3	34·17	+ 8·75	+ 3·92	16·04	34·62	39·58	31·33	−18·71	9·25	35·50	43·83	35·92
4	31·83	+ 9·83	+ 5·50	31·71	40·17	39·96	27·92	−14·75	7·67	35·63	39·83	35·62
5	30·58	+ 3·00	− 0·67	31·25	32·00	29·12	16·50	−16·62	11·58	34·87	44·33	34·08
6	27·96	− 1·80	−14·08	27·00	28·58	20·71	2·50	−18·75	3·83	32·17	47·67	33·96
7	28·42	+ 6·10	−11.12	22·29	37·67	24·62	6·17	−21·00	0·79	29·63	47·42	34·92
8	30·00	+ 3·75	−10·04	19·67	35·83	28·92	18·35	−20·46	3·00	32·08	48·75	36·46
9	30·67	− 1·83	−12·75	18·83	34·42	25·83	8·58	−21·85	4·67	33·92	43·58	34·79
10	31·00	+ 1·83	− 9·67	19·33	36·17	31·62	4·96	−22·96	5·62	32·25	45·67	31·96
11	27·75	+ 4·54	−18·62	11·21	44·42	39·77	2·25	−19·67	4·17	33·92	43·33	31·29
12	29·50	− 4·17	−28·58	14·42	44·71	42.00	24·00	−20·00	8·62	32·54	43·75	34·29
13	26·08	+ 7·60	−28·50	10·96	45·29	41·58	22 71	−22·92	7·62	33·46	46·00	36·92
14	13·79	− 2·50	−26·08	8·29	35·08	46·33	17·83	−19·37	7·50	34·75	48·25	33·22
15	18·92	+ 6·17	−30·88	11·63	35·73	40·92	16·25	− 7·33	9·42	34·67	43·00	32·33
16	21·25	− 5·20	−39·79	13·50	37·08	32·33	21·79	−12·33	12·67	33·75	42·87	32·42
17	19·75	−12·88	−35·63	4·37	24·50	33·42	17·58	−13·62	18·50	34·58	51·08	31·83
18	23·67	− 6·08	−36·00	5·00	10·25	26·25	8·88	− 8·17	18 00	37·33	43·12	33·08
19	29·83	−11·25	−42·92	17·46	17·50	21·04	13·75	− 4·00	17·75	37·67	43·17	33·96
20	17·25	−15·12	−43·71	22·83	24·46	24·08	11·88	− 2·21	16·96	36·25	40·50	31·67
21	15·83	−10·58	−27·79	23·50	19·00	30·25	15·63	− 3·17	18·83	38·17	40·33	30·92
22	19·67	− 6·92	−23·00	31·00	26·00	36·58	13·75	− 4·63	23·00	44·33	45·04	31·79
23	22·08	+ 0·12	−25·	33·83	22·50	37·67	22·42	+ 4·00	27·29	42·08	39·17	31·58
24	20·25	− 2·83	−15·	31·17	24·83	40·92	21·50	+10·42	32·71	37·00	41·83	31·79
25	13·58	+ 3·71	−11·75	26·04	26·42	34·54	26·71	+ 4·88	36·33	37·42	43·58	32·29
26	5·00	− 1·08	−24·79	16·21	31·17	26·33	25·50	− 1·17	33·04	40·50	36·92	28·92
27	15·00	−10·25	−18·38	24·58	33·96	27·75	26·17	+ 0·08	39·17	39·33	34·67	27·83
28	17·33	−19·75	−28·29	36·75	37·23	29·08	24·17	+ 4·83	34·96	37·17	37·29	28·12
29	11·25	−24·25	−31·92	37·38	26·12	29·07	23·88	+12·75	26·54	41·92	34·58	29·00
30	5·92	−26·15	−33·58	38·96	19·58	..	20·29	+20·38	31·08	43·75	37·25	30·00
31	..	−12·17	..	7·17	24·54	..	11·50	..	30·92	..	36·96	31·75
Means	+22·80	− 3·22	−20·56	−21·79	−30·09	−32·17	−18·07	− 8·37	+16·66	+36·24	+42·41	+32·68

Mean temperature of the year on board the *Hecla*, from 4392 observations . . . . . +1°·49 Fahr.

TABLE II.—Results of observations on board the *Griper*, same place and times, 4392 observations, of which the sum is +6049·9 =Mean of year +1·38° Fahr.

Sums	+8106·5	−1052·0	−7611·3	−8041·5	−11636·0	11293·0	−6760·0	−2956·0	+6254·5	+13036·0	+15792·5	+12119·3
Means	+ 22·52	− 2·83	− 21·14	− 21·62	− 31·28	− 32·45	− 18·19	− 8·21	+ 16·82	+ 36.21	+ 42·45	+ 32·59

In the Griper, Lat. 74° 12′ N. 1819-20.	Griper.
Mean temp. of the autumn months, viz. Sept., Oct., Nov.	− 0.43° F.
,, ,, winter months, viz. Dec., Jan., Feb.	− 28·36 F.
,, ,, spring months, viz. March, April, May	− 3·13 F.
,, ,, summer months, viz. June, July, August	+ 37·09 F.
Mean temp. of one year, from Sept., 1819, to Oct., 1820, inclusive, 4392 observations .	+ 1·38° F. Hecla.
,, ,, ten days about the summer solstice, viz. from 16th to 25th June inclusive	+ 37·83 F. −37·86° F.
,, ,, ,, ,, ,, winter solstice, viz. from 16th to 25th Dec. inclusive	− 20·79 F. −20·87 F.

NOTE.—Owing to the breaking of the thermometer, the observations in the Griper were interrupted for 26 hours on the 23-24th Nov. The hourly means for that month were deduced from the observations actually recorded, and the mean of the month was obtained by interpolating 26 observations at the mean rate.

Table. III.—Showing the mean temperature of every alternate hour for each month, and for the whole year, from observations made on board the Griper at Melville Island, lat. 74° 47′ N., in the year 1819-20:—

Hour.	1819.				1820.								Mean temp. of each hour for the year.
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
A.M. 2	+21·40	−4·13	−21·56	−23·03	−30·61	−32·78	−21·44	−14·57	+11·77	+33·53	+38·64	+30·26	−0·91
4	21·28	4·03	21·74	23·52	31·10	32·88	20·69	13·87	12·02	33·77	39·35	30·47	−0·80
6	21·53	3·77	21·28	23·20	31·34	33·16	20·39	12·15	13·42	35·03	41·34	31·24	−0·11
8	21·95	3·13	20·83	22·87	31·82	32·78	19·10	9·23	15·31	36·23	42·63	32·83	+0·88
10	23·07	2·28	20·46	21·49	31·37	32·05	16·73	5·93	18·02	37·55	44·03	34·31	+2·34
Noon.	23·70	1·53	20·55	20·95	31·48	31·26	14·73	3·70	20·22	38·55	45·24	35·19	+3·35
P.M. 2	23·53	1·00	19·82	20·74	30·73	31·07	14·11	1·33	21·39	38·40	45·90	34·74	+3·88
4	23·55	1·39	20·36	20·61	30·85	31·74	15·48	1·43	21·73	38·48	45·10	34·03	+3·54
6	23·10	2·94	20·30	20·82	31·32	32·48	17·13	4·17	20·71	37·75	44·55	33·15	+2.63
8	22·87	3·15	20·84	20·16	31·47	32·81	18·34	8·02	18·37	36·50	42·79	32·27	+1·62
10	22·63	2·98	21·02	20·56	31·48	33·05	19·61	11·17	15.42	35·10	40·50	31·53	+0·56
12	21·60	3.61	21·95	21·44	31·77	33.34	20·48	12·97	13·39	33·63	39·35	30·97	−0·44
Means	+22.52	−2·83	−21·14	−21·62	−31·28	−32·45	−18·19	− 8·21	+16·82	+36·21	+42·45	+32·59	+1·38

The mean temperature for the whole year, from 4392 obs. in the Griper, is +1·38° F.

Note.—The curves for the months, plate i., fig. 1, are projected from the respective columns of the above table; and the mean annual curve for lat. 74° 12′ N. in plate ii., fig. 7, from the last column.

TABLE IV.,—Showing the mean temperature of each alternate hour of the four seasons of the year at Melville Island, lat. 74° 47′ N., from observations on board the *Griper*, in the year 1819-20 :—

Hours.	Autumn; Sept. Oct. Nov.	Winter; Dec. Jan. Feb.	Spring; Mar. Ap. May.	Summer; June, July, Aug
	°	°	°	°
A.M. 2	−1·46	−28·72	−7·94	+34·15
4	−1·52	29·08	−7·44	34·53
6	−1·20	29·15	−6·31	35·88
8	−0·70	29·05	−4·29	37·24
10	+0·01	28·22	−1·50	38·64
Noon.	+0·52	27·82	+0·65	39·67
P.M. 2	+0·88	27·43	+2·01	39·70
4	+0·58	27·65	+1·64	39·21
6	−0·08	28·12	−0·16	38·49
8	−0·40	28·07	−2·60	37·20
10	−0·49	28·26	−5·05	35·72
12	−1·35	28.76	−6·51	34·66
Means	−0·43	−28·36	−3·13	+37·09

TABLE V.,—Showing the mean temperature of each alternate hour for six summer and six winter months, at Melv. Island, lat. 74° 47′ N., in the *Griper*, 1819-20 :—

Hours.	Winter; Sept. to Feb. incl.	Summer; March to Aug. incl.
	°	°
A.M. 2	−15·09	+13·11
4	15·30	13·54
6	15·18	14·78
8	14·89	16·42
10	14·06	18·57
Noon.	13·65	20·16
P.M. 2	13·25	20·86
4	13·54	20·42
6	14·10	19·18
8	14·22	17·30
10	14·37	15·33
12	15·05	14·02
Means	−14·39	+16·98

NOTE.—From these two tables the curves of the four seasons in plate ii., fig. 1, and of the summer and winter halves of the year, plate ii., fig. 6, were projected.

TABLE VI.,—Containing the highest and lowest temperatures for each month, the means of the daily *maxima* and *minima* for each month, and the means of these, or of the extreme daily temperatures, from the *Hecla's* register at Melville Island, in 1819-20 :—

Month.	Highest Temp. in the month.	Lowest Temp. in the month.	Means of Max.	Means of Min.	Means of the Extremes.
1819	°	°	°	°	°
Sept. .	+37·0	− 1·0	+25·30	+18·47	+21·88
Oct. .	+17·5	−28·0	+ 1·60	− 8·34	− 3·37
Nov. .	+ 6·0	−47·0	−16·55	−24·93	−20·74
Dec. .	+ 6·0	−43·0	−16·69	−26·74	−21·72
1820					
Jan. .	− 2·0	−47·0	−25·34	−34·10	−29·72
Feb. .	−17·0	−50·0	−28·07	−36·43	−32·25
March .	+ 6·0	−40·0	−12·05	−24·55	−18·30
April .	+32·0	−32·0	− 0·30	−17·32	− 8·81
May .	+47·0	− 4·0	+23·48	+ 9·29	+16·39
June .	+51·0	+28·0	+40·23	+32·10	+36·17
July .	+60·0	+32·0	+49·06	+36·81	+42·94
Aug. .	+45·0	+22·0	+36·55	+29·19	+32·87
Means	+ 24·04	−14·50	+ 6·65	− 3·62	− 3·02

The highest temperature registered in the year took place at two P.M. on July 17th, and was + 60° F. The lowest was registered on Feb. 15th, at four A.M., and was —50°. The lowest temperature registered on the ice was —55°; and for seventeen hours on the 14th and 15th of February the temperature did not rise above —54° Fahr.

SECTION II.

Observations at Port Bowen.

The ships Hecla, Captain Parry, and Fury, Captain Hoppner, remained from September 27th to July 20th, at Port Bowen, in lat. 73° 14′ N., long. 88° 56′ W. Between the 1st and 27th of September the latitude was varied from 74° 27′ N., to that of the winter quarters, or 73 miles, and between the 20th of July and the end of August, the most southerly position attained was 72° 46′ N., and the most northerly 73° 48′ N., the greatest difference of latitude from that of Port Bowen being only 27 miles. The sun was invisible in the middle of winter for 121 days, but the exact number of days on which it was actually under the horizon was not ascertained on account of the weather being hazy for some time at its disappearance; yet as it was seen from the high lands on the 2nd of February, the time of its absence may be fixed at 84 days. Snow of the preceding year was not gone when the ships entered Port Bowen; that which fell in the winter began to leave the stones about the end of April, and towards the end of May a great deal was dissolved daily, but pools of water did not form till the first week in June. The salt-water ice formed during the winter reached its maximum thickness of 86½ inches in May. The summer (of 1824) preceding the commencement of this register was considered by Sir Edward Parry as unusually cold, the mean temperature of August being about 6 degrees lower than that of August 1825, included in the register.

TABLE VII.—Containing the daily and monthly mean temperatures for one year (1824–5), deduced from observations made every two hours on board the Hecla, at Port Bowen, lat. 73° 14′ N.

Day.	1824.				1825.							
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	August.
	°	°	°	°	°	°	°	°	°	°	°	°
1	+27·88	+16·87	− 1·17	−16·42	− 24·17	−32·87	− 31·46	−29·58	+ 5·12	+ 32·46	+ 39·34	+ 35·68
2	31·04	15·46	+ 2·92	18·37	26·62	38·20	42·96	−27·75	5·88	29·92	38·62	36·50
3	30·25	10·04	+ 5·28	14·25	28·62	33·12	29·29	−23·08	5·58	33·46	40·46	38·62
4	30·04	21·25	+ 7·08	18·17	29·58	22·83	31·29	−23·67	4·84	31·83	35·86	38·50
5	31·00	26·21	+ 9·50	21·58	33·54	22·96	29·33	−28·54	3·46	35·29	36·17	41·88
6	30·79	25·96	− 3·54	18·17	31·92	15·83	29·58	−28·25	13·33	36·67	37·17	36·17
7	30·29	20·04	−13·12	9·25	33·87	21·50	35·29	−25·04	16·04	36·29	39·58	34·46
8	29·12	14·86	− 6·25	13·83	28·46	33·54	28·37	−20·88	19·25	36·86	39·75	35·50
9	29·62	18·08	+ 4·62	15·25	22·42	38·17	27·92	−16·79	22·29	36·42	39·00	40·83
10	27·25	15·62	+ 5·58	15·58	31·54	35·96	30·08	−10·67	11·00	33·79	39·71	41·73
11	23·46	15·50	+ 1·12	11·13	36·87	30·00	34·04	+ 2·46	6·29	32·50	41·67	37·42
12	18·96	14·71	−11·04	10·58	38·08	12·54	32·21	+12·29	8·25	35·25	41·08	37·46
13	19·77	15·71	− 9·79	20·04	24·04	14·00	30·46	− 1·42	11·62	33·96	45·42	40·54
14	21·42	24·83	− 6·29	25·29	18·08	25·79	32·29	− 9·54	17·75	35·21	40·75	42·50
15	21·67	17·83	+ 5·08	30·54	25·67	31·12	27·62	−10·42	23·27	32·92	41·79	44·79
16	19·79	21·50	−13·21	33·21	29·58	32·50	25·50	− 1·83	18·50	37·96	40·75	39·67
17	22·14	15·62	−11·29	27·96	28·29	18·25	24·38	− 2·92	21·96	38·83	41·75	34·67
18	18·79	13·42	−13·04	22·08	21·92	28·96	23·04	− 2·71	21·17	38·25	38·67	32·58
19	22·33	6·37	−18·04	14·83	17·67	33·25	21·50	− 1·71	20·21	37·58	33·42	33·00
20	26·12	1·83	−19·42	19·54	24·17	39·42	22·29	+ 6·67	20·08	35·92	39·33	32·92
21	26·96	3·96	−11·96	29·17	28·50	40·35	22·33	+10·87	22·33	36·54	37·58	32·95
22	25·05	2·08	−13·54	26·67	27·58	31·92	29·17	+ 8·08	21·04	38·17	38·62	31·92
23	26·21	2·96	−13·08	30·04	27·83	26·46	30·46	+ 6·87	20·50	39·50	41·25	32·29
24	28·17	5·87	− 6·83	17·83	36·21	26·71	33·50	+ 3·17	16·87	38·25	36·00	32·96
25	23·08	6·17	−16·92	20·58	40·12	30·37	33·54	+ 6·92	21·50	37·29	35·75	31·75
26	22·64	5·17	−16·12	25·71	38·00	17·17	23·92	+ 2·21	27·25	37·42	36·12	33·37
27	32·75	1·00	+12·12	16·92	26·50	10·17	18·00	+ 3·54	26·75	41·50	38·92	33·54
28	29·17	− 7·87	+ 1·92	9·21	30·37	20·92	22·75	+ 3·67	31·87	39·25	40·00	33·83
29	24·78	− 4·50	+ 2·00	11·79	28·25	...	23·42	+ 0·96	23·83	37·87	39·08	32·58
30	25·96	− 8·92	− 2·46	12·29	26·37	...	24·92	+ 2·21	28 71	36·42	35·23	27·50
31	...	− 1·29	...	14·21	31·50	...	28·71	...	30·25	...	36·17	30·79
Means	+25·88	+10·85	− 5·00	−19·05	− 28·91	−27·32	− 28·37	− 6·50	+17·63	+ 36·12	+ 38·87	+ 35·77

Mean temperature of the year on board the Hecla from the above table . . . . . + 4°·33

TABLE VIII.—Results of the same set of observations (except for July and August, which were made in the Fury*), arranged by the hours, and placed here for comparison. Sum + 18965·8. Mean of year + 4·33.

Sums	+9326·5	+4028·5	−1804·0	−7085·0	−10756·0	−9177·0	−10550·5	−2342·0	+6555·5	−13003·3	−14460·5	−13306·0
Means	+ 25·91	+ 10·83	− 5·01	− 19·05	− 28·91	− 27·31	− 28·36	− 6·51	+ 17·62	+ 36·12	+ 38·87	+ 35·77

In the Hecla, Port Bowen, Lat. 73° 14′ N.

		°
Mean temp. of the autumn months, viz. Sep., Oct., Nov.	. . . . .	+ 10·58 F.
„ „ „ winter months, viz. Dec., Jan., Feb.	. . . . .	− 25·02
„ „ „ spring months, viz. March, April, May	. . . . .	− 5·74
„ „ „ summer months, viz. June, July, August	. . . . .	+ 36·93
Mean temp. of one year, from Sept. 1824 to August 1825, inclusive, 4380 observations	. .	+ 4·33
„ „ „ 10 days about the summer solstice, viz. from 16th to 25th June, inclusive	.	+ 37·83
„ „ winter solstice, viz. from 16th to 25th December inclusive	. . .	− 24·19

* NOTE.—The register of observations kept in the Hecla, and deposited in the Admiralty, being defective for July and August this year, the Fury's register was referred to, but as after the loss of this vessel in the middle of August, the register was discontinued, the remainder of that month was filled up from Sir E. Parry's printed Journal, from which the whole of the daily means in Table VII. were also extracted.

TABLE IX.—The mean temperature of every alternate hour for each month and for the whole year, from observations made on board the Hecla, at Port Bowen, in the year 1824–25, in lat. 73° 14′ N.

Hour.	1824.				1825.								Mean of each hour for the year.
	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
A.M. 1	+25·30	+10·40	− 4·50	−18·89	−29·05	−27·55	−31·42	−12·53	+ 12·42	+31·93	−36·47	−34·35	+ 2·40
3	25·53	10·37	5·02	18·79	29·16	27·32	31·11	−12·70	12·81	32·98	36·90	34·43	2·57
5	25·33	10·11	5·12	18·58	29·29	27·36	31·41	−11·47	15·31	34·28	37·68	34·43	2·99
7	25·57	10·69	5·53	18·61	29·31	27·07	30·29	− 7·52	17·63	36·83	38·56	35·37	4·02
9	26·22	11·13	5·42	18·45	28·61	26·68	26·22	− 3·50	20·34	38·10	39·77	35·92	5·38
11	26·35	11·92	5·47	18·47	28·33	26·61	23·92	− 0·85	20·98	39·58	40·98	36·97	6·27
P.M. 1	26·78	11·94	5·42	19·11	28·69	27·12	22·68	+ 0·85	22·14	39·61	41·21	36·98	6·55
3	26·75	11·53	5·38	19·65	28·82	27·62	23·72	+ 0·13	21·94	39·53	40·76	37·37	6·24
5	26·32	11·15	5·12	19·42	28·76	27·30	26·44	− 2·88	19·52	36·70	39·85	37·18	5·24
7	25·97	10·90	4·35	19·74	28·89	27·61	29·74	− 6·63	17·85	36·22	38·79	36·31	4·25
9	25·50	10·13	4·28	19·34	28·95	27·82	31·48	− 9·87	16·08	34·72	38·22	35·53	3·37
11	25·28	9·68	4·53	19·50	29·08	27·66	31·89	−11·08	14·45	32·95	37·26	34·37	2·68
Means	+25·91	+10·83	− 5.01	−19·05	−28·91	−27·31	−28·36	+ 6·50	+17·62	+36·12	+38·87	+35·77	+ 4·33

Mean temperature of the year by 4,380 obs. (sum + 18965·8) is+ 4·33° Fahr.

TABLE X.—Showing the mean temp. for each alternate hour of the four seasons in the year 1824-5, at Port Bowen, lat. 73° 14′ N.

Hours.	Autumn; Sep. Oct. Nov.	Winter; Dec. Jan. Feb.	Spring; March, April, May.	Summer; June, July, Aug.
	°	°	°	°
A.M. 1	+10·40	−25·06	−10·50	+34·25
3	10·30	25·02	10·31	34·77
5	10·11	25·00	9·17	35·46
7	10·25	24·93	6·72	36·92
9	10·65	24·51	3·12	37·93
11	10·95	24·41	1·27	39·18
P.M. 1	11·11	24·91	+ 0·10	39·27
3	10·99	25·29	− 0·56	39·22
5	10·79	25·09	3·27	37·91
7	10·84	25·34	6·17	37·11
9	10·45	25·29	8·41	36·16
11	10·11	25·34	9·49	34·86
Means	+10·58	−25·02	− 5·74	+36·93

TABLE XI.—Showing the mean temp. of each alternate hour of six summer and six winter months, from the same set of observations.

Hours.	Winter; Sep. to Feb. incl.	Summer; March to August, inclusive.
	°	°
A.M. 1	−7·24	+11·89
3	7·26	12·24
5	7·35	13·15
7	7·24	15·10
9	6·83	17·40
11	6·63	18·95
P.M. 1	6·80	19·68
3	7·06	19·33
5	7·05	17·33
7	7·15	15·47
9	7·38	13·88
11	7·51	12·70
Means.	−7·12	+15·60

NOTE.—From table ix. plate i. fig. 2, is projected; from table x. plate ii. fig. 2; from table xi. plate ii. fig. 6; and plate ii. fig. 7, partly from the last column of table ix.

TABLE XII.—Containing the highest and lowest temperatures of each month, the means of the daily maxima and minima for the several months and the whole year, and also the means of these, or of the extremes for the same times, from the Hecla's register kept at Port Bowen.

Month.	Highest Temp. in the month.	Lowest Temp. in the month.	Means of Maxima.	Means of Minima.	Means of Extremes.
1824.	°	°	°	°	°
September	+ 34·0	+ 16·0	+ 28·07	+ 23·18	+ 25·62
October	+ 31·5	− 12·0	+ 14·39	+ 6·58	+ 10·48
November	+ 17·0	− 26·0	+ 1·33	− 9·98	− 4·32
December	− 4·5	− 35·0	− 14·92	− 22·76	− 18·84
1825.					
January	− 14·5	− 42·5	− 25·27	− 32·24	− 28·76
February	− 8·0	− 45·0	− 22·96	− 31·86	− 27·42
March	− 9·0	− 47·5	− 21·44	− 34·76	− 28·10
April	+ 20·0	− 37·0	+ 1·97	− 14·78	− 6·41
May	+ 39·0	− 7·5	+ 24·40	+ 11·13	+ 17·77
June	+ 47·0	+ 23·0	+ 40·74	+ 30·16	+ 35·45
July	+ 50·0	+ 30·0	+ 41·63	+ 33·53	+ 37·58
August	+ 51·0	+ 25·0	+ 39·29	+ 32·47	+ 35·88
Means.	+ 12·12	− 13·21	+ 9·21	− 0·52	+ 4·34

The highest temperature occurred on the 15th of August, at 5 p.m. + 51·0. The lowest temperature occurred on the 2nd of March at 7 a.m. — 47·5.

SECTION III.

Observations at Igloolik.

The *Fury* and *Hecla* cruized in the entrance of the strait which bears their name, from the 1st of August, when this year's register commences, varying their latitude little until the end of October, when they were secured for the winter at Igloolik, a small island lying a little south of the strait. The latitude of this place is 69° 21′ N., and the longitude 81° 53′ W. The ships remained shut up in the ice here till after the year of observation was completed. The upper limb of the sun was seen at noon on the 2nd of December, about one-sixteenth of its whole disk being visible from the *Fury's* deck, over the low land to the southward. This was six days after it would have set, independent of refraction. The exact date of its reappearance in January could not be ascertained, owing to the sky being overcast for a fortnight after the 5th, on which day the sky was so red in the south at noon, that the sun was looked out for from the mast-head, but without success. Its period of absence is probably about 38 days. About the summer solstice the sun was visible at midnight for 58 or 60 days, eight or ten of which are due to refraction, which at a low temperature amounts on the horizon to three degrees or more.* The snow continued to cover the land late in June, and on the 11th of that month travelling parties suffered severely from snow-blindness. This affection seldom appears after stones or patches of land have become visible. The ice on the lakes was at this time from five to seven feet in thickness.

The thermometrical registers in both ships have been reduced that their results may be compared, and the means of both are used for calculating and projecting the various curves.

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* *Vide* Mr. Fisher's Papers on Solar and Terrestrial Refraction, in the Appendix to Parry's Second Voyage.

TABLE XIII.—Containing the daily and monthly mean temperatures for the year 1822-23, from observations made every two hours on board the Fury, at Igloolik, in the Fury and Hecla Straits, lat. 69° 21′ N.:—

Day.	1822.					1823.						
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.
	°	°	°	°	°	°	°	°	°	°	°	°
1	+32·75	+30·00	+17·58	+ 0·08	−16·42	−43·75	−17·25	−36·58	−11·42	+ 5·33	+24·17	+39·08
2	36·04	31·83	13·83	−14·50	27·92	42·50	+ 8·92	35·79	− 6·04	11·33	19·25	36·07
3	39·37	27·58	14·67	−17·67	19·17	44·17	+13·58	36·54	− 6·17	10·92	22·29	36·50
4	34·54	27·58	12·42	−16·79	16·33	41·92	+ 1·62	36·75	− 3·92	25·42	26·25	37·96
5	34·33	27·17	10·92	− 9·92	19·17	38·21	− 5·29	32·08	− 8·33	23·96	26·00	37·67
6	37·42	24·71	7·67	−12·08	18·50	31·21	10·00	23·67	−13·92	32·00	22·33	37·67
7	35·25	22·92	7·42	−21·75	23·92	26·42	19·71	25·33	−15·38	34·75	28·67	39·17
8	33·42	25·58	22·12	−18·50	30·62	22·00	18·17	22·17	− 8·42	35·62	31·00	37·00
9	32·92	25·08	19·83	+ 1·46	38·35	15·00	9·42	19·42	+ 0·96	38·12	28·83	34·42
10	36·37	25·37	24·17	− 8·17	40·42	2·17	24·87	23·42	+ 3·00	30·0	33·50	39·58
11	33·96	26·33	23·33	−26·04	40·42	11·71	13·25	28·33	− 3·92	29·96	32·50	38·17
12	31·04	30·29	21·08	27·25	39·29	13·92	11·79	26·08	− 0·67	24·25	25·75	35·58
13	34·04	30·42	23·64	28·37	36·58	3·25	18·42	14·71	− 8·12	20·00	29·50	38·89
14	33·04	27·83	16·79	24·00	28·42	+17·50	20·54	13·29	−13·33	23·46	31·50	40·37
15	34·42	24·25	17·33	20·21	26·67	+16·42	27·08	19·29	−15·04	30·79	34·42	45·80
16	33·17	25·83	17·38	18·08	32·50	+ 1·83	40·54	21·67	− 7·12	21·29	35·92	45·75
17	32·62	17·33	12·25	15·25	32·83	− 2·25	35·67	18·58	− 0·83	23·12	31·83	49·75
18	34·08	13·21	8·33	14·17	33·33	0·29	31·00	21·50	+ 7·58	20·25	33·12	51·83
19	35·75	14·29	14·25	3·50	31·00	13·08	37·00	15·17	− 5·42	18·42	30·00	50·33
20	24·58	18·00	8·83	16·88	21·42	19·83	29·00	11·42	0·00	17·58	33·00	39·25
21	32·67	25·88	4·67	21·67	17·04	20·17	20·58	9·08	− 3·50	18·00	32·37	40·08
22	32·71	27·66	−1·71	27·67	14·17	21·42	20·46	8·71	+ 3·17	22·12	35·33	37·92
23	33·08	26·92	−5·54	30·83	14·29	30·42	26·75	10·54	+ 4·42	26·17	35·25	30·17
24	33·92	22·25	+8·33	31·25	13·25	29·87	30·83	8·67	+ 2·33	28·83	41·67	39·92
25	33·62	18·90	7·25	31·58	21·00	22·83	33·67	3·88	+ 6·00	31·17	38·75	39·58
26	32·67	28·42	5·88	25·33	28·96	21·08	21·62	12·21	+ 3·50	38·21	38·83	38·67
27	32·75	27·96	9·67	24·71	32·96	+ 0·67	34·33	10·08	+ 9·75	27·00	39·83	43·17
28	30·71	24·75	12·37	26·96	33·25	− 3·37	38·33	18·46	+17·42	32·45	38·50	38·58
29	30·42	17·29	13·67	28·67	36·50	7·92	..	18·71	+18·92	31·25	41·67	40·42
30	32·42	17·75	13·50	20·83	38·83	16·75	..	15·92	+ 4·17	19·42	42·33	36·25
31	29·92	..	14·62	..	38·37	20·04	..	14·08	..	18·25	..	36·17
Means	+33·71	+24·45	+12·75	−19·32	−27·82	−17·06	−20·49	−19·70	− 1·66	+24·78	+32·12	+39·97

Mean temperature of the year on board the Fury, from 4380 obs. (sum +23269·5) is . +5·313° F.

TABLE XIV.—Results of 4380 obs. in the Hecla, same hours, year, and place, of which the sum is + 26789·0, and the mean is +6·116° F.

Sums	+12668·5	+9267·0	+5464·0	−6478·0	−10667·5	−5653·0	−6275·0	−6815·0	−14·0	+9490·0	+11595·5	+14211·0
Means	+34·06	+25·74	+ 14·69	−17·99	−28·68	−15·21	−18·68	−18·32	−0·04	+25·51	+32·21	+38·20

Seasons.	*Lat.*	*Fury.* °	*Hecla.* °
Mean temp. of the autumn months, viz. Sept., Oct., Nov.	.	+6·03 F.	+7·56 F.
" " winter months, viz. Dec., Jan., Feb.	.	−21·83	−20·93
" " spring months, viz. March, April, May	.	+1·17	+2·41
" " summer months, viz. June, July, Aug.	.	+35·27	+34·85
Mean temp. of one year, by two sets of observations, each recorded 4380 times	.	+5·31 F.	+6·12 F.
Mean temp. of ten days about the summer solstice, viz. from 16th to 25th June inclusive	.	+34·72 F.	
Mean temp. of ten days about the winter solstice, viz. from 16th to 25th Dec. inclusive	.	−23·08	

Table XV.—Showing the mean temperature of every second hour for each month, and for the whole year, from observations made on board the Fury, at Igloolik, in the Fury and Hecla Straits. Lat. 69° 21′ N., in the year 1822-3.

Hour.	1822.					1823.							Mean temp. for each hour.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
A.M. 2	+31·27	+22·57	+11·43	−19·30	−28·02	−17·90	−21·57	−23·61	− 8·7	+18·39	+24·92	+35·48	+ 2·23
4	31·58	22·78	11·43	19·37	27·82	17·61	21·98	23·89	− 8·77	19·47	25·57	36·32	2·48
6	32·11	22·95	11·52	18·92	27·90	17·48	22·09	23·95	− 7·32	21·26	29·40	38·16	3·32
8	33·48	24·52	12·11	18·30	28·16	17·53	21·50	21·24	− 2·87	24·97	32·63	40·74	5·08
10	34.68	25·58	14·27	18·47	27·37	16·87	19·32	17·08	+ 2·60	27·79	35·30	42·06	7·10
Noon.	35·37	26·87	15·23	18·33	27·15	15·05	17·38	15·13	+ 5·33	30·19	37·22	43·79	8·58
P.M. 2	36·76	27·03	14·71	18·45	27·16	15.26	17·04	12·93	+ 6·70	30·85	37·70	44·26	9·10
4	36·69	26·48	13·87	18·90	27·90	16·14	19·52	13·79	+ 5·80	29·89	37·95	43·84	8·36
6	34·93	25·17	13·18	20·25	27·65	17·29	20·77	17·58	+ 2·37	28·06	35·83	42·19	6·69
8	33·34	23·98	12·39	20·48	27·92	17·50	21·39	20·47	− 2·10	24·95	34·40	39·48	5·06
10	32·45	23·05	11·40	20·80	27·97	18·19	21·71	22·71	— 5·62	21·37	28·63	37·32	3·28
12	31·81	22·43	11·45	20·27	28·84	17·84	21·61	24·03	— 7·23	20·06	25·90	35·97	2·48
Means	+33·71	+24·45	+12·75	−19·32	−27·82	−17·06	−20·49	−19·70	− 1·66	+24·78	+32·12	+39·97	+ 5·31

The mean temp. for the whole year in the Fury, from 4380 obs. (sum +23275·0°) was +5·31° Fahr.

TABLE XVI.—Mean temperature same times and place, from observations made on board the Hecla.

Hour.	1822.					1823.							Mean temp. for each hour.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
A.M. 2	+32·55	+24·18	+13·40	−17·52	−28·76	−16·19	19·04	−21·77	− 5·93	+18·68	+24·57	+34·03	+ 3·33
4	32·68	24·03	13·61	17·63	28·92	16·18	19·82	22·03	− 6·17	19·87	26·13	34·84	3·52
6	33·37	24·55	14·02	17·73	28·79	15·61	19·86	21·58	− 5·17	22·32	29·47	36·48	4·45
8	33·92	25·88	14·49	17·25	28·69	15·55	19·98	20·10	− 1·20	25·39	33·22	40·03	6·01
10	34·99	27·12	15·90	16·93	27·72	14·84	18·04	16·58	+ 4·00	29·16	37·13	41·39	8·13
Noon 12	35·63	27·72	17·05	17·18	27·68	13·90	16·00	14·19	+ 5·57	32·26	38·87	42·03	9·34
P.M. 2	35·40	27·48	16·29	17·33	28·02	13·60	16·32	12·13	+ 6·40	32·42	39·33	42·03	9·49
4	35·58	27·08	15·65	17·88	28·68	14·36	17·79	13·55	+ 5·47	30·90	37·70	40·81	8·58
6	34·72	26·30	14·55	19·27	29·19	15·19	18·36	17·13	+ 2·57	27·84	34·80	38·42	6·83
8	32·90	25·52	14·37	19·45	29·19	16·21	19·39	19·26	− 0·30	24·81	31·90	37·22	5·49
10	33·14	24.60	13·55	19·05	29·15	15·69	19·57	20·35	− 2·30	21·94	27·83	36·06	4·41
12	32·77	24·43	13·39	18·68	29·47	15·19	19·95	21·16	− 3·40	20·55	25·57	35·06	3·82
Means	+34·06	+25·74	+14·69	−17·99	−28·68	−15·21	−18·68	−18·32	− 0·04	+25·51	+32·21	+38·20	+ 6·12

The mean temperature for the whole year, in the Hecla, from 4380 obs. (sum +26789·0) was +6·12° Fahr.

Table XVII.—Means of the two preceding sets of observations.

Hour.	1822.					1823.							Mean temp. for each hour.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	
A.M. 2	+31·91	+23·37	+12·42	−18·41	−28·39	−17·05	−20·30	−22·69	− 7·40	+18·53	+24·74	+34·76	+ 2·78
4	32·13	23·40	12·52	18·50	28·37	16·89	20·90	22·96	− 7·47	19·67	25·85	35·58	3·00
6	32·74	23·75	12·77	18·32	28·35	16·55	20·97	22·77	− 6·24	21·79	29·43	37·32	3·88
8	33·70	25·20	13·30	17·77	28·42	16·54	20·74	20·67	− 2·03	25·18	32·92	40·39	5·54
10	34·83	26·35	15·08	17·70	27·53	15·86	18·69	16·83	+ 3·30	28·47	36·21	41·73	7·61
Noon.	35·50	27·29	16·14	17·76	27·41	14·48	16·69	14·66	+ 5·45	31·23	38·04	42·91	8·96
P.M. 2	36·08	27·26	15·51	17·89	27·59	14·43	16·68	12·53	+ 6·55	31·64	38·51	43·15	9·29
4	36·14	26·79	14·76	18·39	28·25	15·25	18·65	13·67	+ 5·63	30·40	37·82	42·32	8·47
6	34·83	25·73	13·86	19·76	28·40	16·24	19·56	17·35	+ 2·47	27·95	35·31	40·31	6·76
8	33·62	24·74	13·38	19·96	28·54	16·85	20·39	19·86	− 1·20	24·88	33·15	38·35	5·27
10	32·79	23·82	12·48	19·92	28·56	16·94	20·64	21·53	− 3·96	21·65	28·23	36·39	3·84
12	32·29	23·43	12·42	19·47	29·15	16·52	20·78	22·60	− 5·32	20·31	25·73	35·52	3·15
Means	+33·88	+25·09	+13·72	−18·65	−28·25	−16·13	−19·58	−19·01	− 0·85	+25·14	+32·16	+39·09	+ 5·71

The mean of the whole year, by 8760 observations, was +5°·71 Fahr.

Plate i. fig. 3 is projected from Table xvii., the last column being also used in the construction of Plate ii. fig. 7.

TABLE XVIII.—Showing the mean temp. of each alternate hour of the four seasons of the year 1822-23, at Igloolik, in the Fury and Hecla Straits, from 8760 obs. on board the Fury and Hecla, lat. 69° 21′ N.:—

Hours.	Autumn; Sept. Oct. Nov.	Winter; Dec. Jan. Feb.	Spring; March, April, May.	Summer; June, July, Aug.
	°	°	°	°
A.M. 2	+5·87	−21·97	−3·82	+30·53
4	5·88	22·09	−3·54	31·24
6	6·14	21·99	−2·36	33·21
8	6·98	21·93	+0·86	35·70
10	7·99	20·76	+5·00	37·61
Noon.	8·64	19·62	+7·36	38·83
P. M. 2	8·36	19·67	+8·57	39·26
4	7·79	20·78	+7·47	38·76
6	6·69	21·46	+4·37	36·83
8	6·13	21·98	+1·30	35·06
10	5·53	22·09	−1·25	32·62
12	5·54	21·19	−2·51	31·24
Means	+6·80	−21·38	+ 1·79	+35·07

TABLE XIX.—Showing the mean temp. of each alternate hour for six summer and six winter months, deduced from the same two sets of observations, making together 8760:—

Hours.	Winter; Sept. to Feb. incl.	Summer; March to Aug. incl.
	°	°
A.M. 2	−7·97	+13·36
4	8·03	13·85
6	7·85	15·42
8	7·40	18·28
10	6·30	21·30
Noon.	5·41	23·09
P.M. 2	5·57	23·91
4	6·42	23·12
6	7·31	20·60
8	7·85	18·18
10	8·20	15·69
12	8·25	14·37
Means	−7·21	+18·45

NOTE.—Plate ii., fig. 3, is constructed from table xviii., and plate ii., fig. 6, partly from table xix.

TABLE XX.—Containing the highest and lowest temperatures of each month, the means of the daily *maxima* and *minima* for the several months and the whole year, and the averages from the combination of these for the same periods, from the Fury's register, kept in 1822-23, at Igloolik:—

Months.	Highest temp. in the month.	Lowest temp. in the month.	Means of Maxima.	Means of Minima.	Means of Extremes.
1822	°	°	°	°	°
Aug. . .	+50·0	+27·0	+37·90	+30·40	+34·15
Sept. . .	+37·0	+11·0	+28·02	+20·35	+24·18
Oct. . .	+29·0	− 9·0	+16·68	+ 8·34	+12·52
Nov. . .	+ 8·0	−32·0	−14·52	−24·35	−19·43
Dec. . .	−10·0	−43·0	−24·18	−31·48	−27·83
1823					
Jan. . .	+22·0	−45·0	−12·05	−22·19	−17·12
Feb. . .	+21·0	−43·0	−14·86	−27·05	−20·95
March . .	+ 4·0	−41·0	−12·47	−26·71	−19·59
April . .	+32·0	−25·0	+ 8·70	−12·57	− 1·93
May . .	+49·5	− 8·0	+32·74	+16·02	+24·38
June . .	+52·0	+ 8·0	+39·90	+23·75	+31·82
July . .	+59·0	+30·0	+46·10	+34·78	+40·44
Means	+29·46	−14·17	+11·16	− 0·71	+ 5·23

The highest temp. occurred on July the 19th, at ten A.M., and was + 59·0 F. The lowest temp. occurred on the 1st of January, at eight P.M., and was — 45·0 F.

SECTION IV.

Observations at Winter Island.

The wintering place thus named lies in lat. 66° 11′ N., and long. 83° 11′ W. The ships entered it in the beginning of October, and remained there till after the close of the register. This commences with July, which was spent in Hudson's Straits, between the parallels of 61° and 64° N. lat. August was consumed in Foxe's Channel and Frozen Strait, within the parallels of $65\frac{1}{4}$° N. lat., and $66\frac{1}{2}$° N.; and September, mostly at anchor in Fivehawser Bay or Safety Cove, in latitudes 66° 32′ N. and 66° 36′ N. During the winter there was generally more or less open water in the offing, producing near the horizon a dense frost smoke. As late as December, and even January, there was no "old ice" visible for many miles, the sea being then covered with a thin sheet of "young ice," the produce of a single day. On the shortest day there was three hours' daylight for writing in the cabin, and about five hours for convenient walking on shore. The ships were for the first time in the season, after entering their winter quarters, enveloped in a fog on the 2nd of May. The dissolution of the snow proceeded rapidly in that month; on the 5th pools began to form by its melting; and on the 7th its average depth on the ice was 8 inches, being double its depth in March. The thermometers were, as usual, hung on the outside of the ships in the shade, and both registers are discussed, the curves being calculated for each, and also for the means of the two.

TABLE XXI.—Containing the daily and monthly mean temperatures for one year (1821—22), deduced from observations made every two hours on board the Fury, at Winter Island, lat. 66° 11′ N.

Day.	1821.						1822.					
	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.
	°	°	°	°	°	°	°	°	°	°	°	°
1	+ 30·50	+ 35·17	+ 39·25	+30·50	+20·25	−17·54	−19·79	−20·92	−24·25	− 6·37	+ 7·67	+ 34·91
2	30·71	36·25	35·58	+29·71	+13·08	23·67	22·08	23·42	3·37	− 3·58	13·42	30·25
3	30·08	34·75	32·92	+25·00	−11·96	26·83	21·58	28·92	14·50	+ 0·83	25·96	34·91
4	32·87	34·67	33·87	+19·25	− 1·71	17·67	15·75	32·67	25·37	− 1·17	22·92	35·29
5	33·46	37·58	32·67	+16·12	+ 4·33	5·75	22·50	31·54	25·92	+ 2·08	24·33	30·79
6	35·18	38·25	35·75	+15·37	+18·33	+ 0·33	19·04	27·33	19·83	+ 3·75	21·04	30·00
7	34·58	38·50	34·46	+13·12	+20·67	+ 0·33	18·46	21·42	4·83	− 3·00	22·92	33·46
8	33·42	35·58	35·00	+ 8·04	+18·00	− 4·25	19·33	25·29	+ 7·33	+ 7·42	24·75	26·42
9	35·42	36·50	34·54	+18·12	+15·08	16·33	20·04	20·25	+ 7·00	+ 3·87	25·42	27·00
10	35·58	38·42	32·46	+11·17	+16·04	17·50	9·42	26·46	−10·62	+ 6·08	21·42	29·58
11	35·17	38·50	33·67	+ 2·67	+21·96	20·50	11·29	26·08	−13·71	+ 7·71	16·67	32·92
12	35·96	35·04	35·25	+ 6·62	+27·50	19·21	19·96	24·92	15·67	+ 7·21	15·75	30·33
13	35·96	34·50	35·92	+10·33	+21·79	22·25	22·67	22·33	0·17	+ 1·87	17·25	32·33
14	34·46	35·67	34·58	+ 3·71	+20·71	25·50	23·75	25·29	1·37	+ 1·75	22·25	31·17
15	34·83	40·50	34·96	+ 5·42	+24·50	18·33	22·25	9·92	12·12	+ 2·96	25·17	27·00
16	33·42	41·42	32·46	+ 3·17	+ 9·12	11·12	20·29	23·42	23·75	+ 0·33	23·00	36·83
17	36·83	41·75	26·54	+12·67	+ 0·17	8·42	18·62	22·92	17·75	+ 0·79	25·50	37·92
18	36·92	37·87	28·42	+18·92	+ 3·83	10·58	28·46	31·17	18·00	+ 4·46	22·83	39·25
19	39·25	39·04	29·04	+ 9·58	+ 6·50	13·00	30·00	33·33	21·25	+ 4·67	15·83	37·75
20	39·17	38·12	27·17	− 1·08	+10·17	9·00	33·00	30·42	19·42	+ 8·58	17·08	36·75
21	38·83	33·67	26·08	− 6·33	+ 9·00	11·33	33·29	25·17	12·42	+ 8·08	20·21	34·83
22	35·50	33·75	29·12	−10·17	+ 7·37	4·67	28·33	19·67	18·00	+10·50	27·96	35·33
23	38·54	32·29	26·96	− 9·25	− 3·25	4·00	30·71	21·33	16·96	+10·17	33·08	35·46
24	36·50	32·42	24·29	+ 0·42	− 7·42	3·67	21·92	27·42	14·17	+ 5·87	32·29	36·50
25	34·29	32·46	29·42	+16·42	+ 0·08	+ 1·00	19·54	28·71	18·54	+13·67	29·42	37·67
26	36·83	32·92	29·37	+22·96	− 5·04	− 1·08	26·46	17·75	9·62	+21·12	25·67	37·00
27	39·83	34·17	27·12	+23·13	−17·42	5·00	32·79	18·54	6·12	+24·33	20·17	36·67
28	35·83	36·08	23·86	+17·50	−15·08	16·79	34·00	32·42	7·92	+ 9·96	23·42	38·50
29	37·58	37 83	24·17	+18·37	+ 0·33	22·42	30·58	...	+ 2·75	+ 3·42	25·00	37·75
30	34·58	41·37	26·92	+24·79	+ 4·92	23·33	18·67	...	− 0·38	+ 7·88	24·33	31·00
31	34·71	39·58	...	+22·67	...	23·08	18·25	...	− 2·00	...	29·17	...
Means	+ 35·38	+ 36·60	+ 31·06	+12·51	+ 7·74	−12·94	−22·99	−24·97	−11·64	+ 5·51	+23·09	+ 33·85

Sum of the col. in preceding table + 3506·43, divided by 365, gives as the mean temp. of the year + 9·60.

TABLE XXII.—Results of observations in the Hecla, same place and times, by 4380 observations, of which the sum is + 41830·0 and the mean + 10·00.

Sums	+13126·0	+13816·0	+11581·5	+5128·7	+2894·5	−5785·5	−8695·0	−7745·5	−3686·5	+2696·0	+8757·5	+11689·0
Means	+ 35·29	+ 37·14	+ 32·17	+13·79	+ 8·04	−15·55	−23·27	−23·05	− 9·91	+ 7·49	+23·54	+ 32·47

Seasons . . . . Lat. 66° 11′ N.	Fury. °	Hecla. °
Mean temp. of the autumn months, viz. Sept. Oct. Nov.	+ 17·11	+ 18·00
„ „ winter months, viz. Dec. Jan. Feb.	− 20·13	− 20·58
„ „ spring months, viz. March, April, May	+ 5·66	+ 7·04
„ „ summer months, viz. June, July, August . . .	+ 35·31	− 34·99
Mean temp. of one year, by two sets of observations, each recorded 4380 times	+ 9·63	+ 10·00
Mean temp. of ten days about the summer solstice, 16—25th June incl. . .	+ 36·83 F.	
„ „ about the winter solstice, 16—26th Dec. inclu. . . .	− 26·42 F.	

NOTE.—In the copy of the Fury's Meteorological Journal deposited at the Admiralty, the temperature for the 17th and 18th of June are erroneous, those for the same days of May having been inserted by mistake. The error was detected by comparison with the Hecla's Journal, and with Sir E. Parry's narrative, where the true means of those days are printed.

Table XXIII.—Showing the mean temperature of every alternate hour for each month, and for the whole year, from observations made on board the Hecla at Winter Island, Lat. 66° 11′ N., in the year 1821-22.

Hour.	1821.						1822.						Mean temp. of each hour for the year.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
A.M. 2	+32·48	+34·56	+30·90	+12·03	+ 7·53	−15·35	−23·84	−23·96	−12·93	+ 2·97	+15·48	+28·27	+ 7·49
4	32·53	35·02	30·97	11·95	7·48	15·37	23·90	24·04	12·68	2·70	17·32	28·98	7·73
6	33·56	35·72	31·35	12·74	7·67	15·55	23·52	23·86	12·22	5·28	20·68	30·23	8·66
8	34·70	36·84	31·92	13·44	7·98	15·28	23·00	23·52	10·97	7·57	23·44	33·03	9·84
10	36·55	38·06	32·95	14·79	8·67	14·90	22·93	22·25	8·53	10·88	26·65	35·53	11·45
Noon.	37·00	38·89	33·47	15·45	8·70	14·79	22·32	21·43	7·00	13·12	29·89	37·68	12·54
P.M. 2	37·97	39·18	33·28	15·61	8·80	15·24	22·35	21·21	6·10	12·83	30·60	36·45	12·65
4	37·82	39·22	33·33	15·16	8·65	15·48	22·81	21·95	6·84	11·43	30·03	35·65	12·19
6	36·81	38·50	32·88	14·56	8·10	15·68	23·47	23·00	9·13	9·32	27·03	33·48	10·95
8	36·08	37·22	32·43	13·95	8·08	16·13	23·85	23·71	10·58	6·27	23·90	30·98	9·72
10	34·45	36·55	31·62	13·18	7·53	16·34	24·06	23·82	10·61	3·97	19·65	30·00	8·67
12	33·47	35·90	30·95	12·59	7·28	16·53	24·42	23·88	11·32	3·53	17·84	29·33	8·05
Means	+35·29	+37·14	+32·17	+13·79	+ 8·04	−15·55	−23·37	−23·05	− 9·91	+ 7·49	+23·54	+32·47	+10·00

The mean temperature of the year in the Hecla, from 4380 observations (sum 43776·7) +10·00° Fahr.

TABLE XXIV.—Mean temperature same times and place, from observations on board the Fury.

Hour.	1821.						1822.						Mean temp. of each hour for the year.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
A.M. 2	+33·06	+34·29	+29·53	+11·39	+ 7·15	−12·64	−23·87	−26·27	−14·06	+ 1·43	+14·19	+28·12	+ 7·03
4	33·29	34·63	29·83	11·21	7·38	13·00	23·93	25·87	14·39	1·43	15·58	29·43	7·30
6	33·95	35·18	29·90	11·16	7·27	12·64	23·37	25·82	13·83	2·63	21·00	31·93	8·28
8	34·97	36·40	30·35	12·00	7·83	12·48	22·43	25·20	12·42	5·03	22·84	34·76	9·47
10	36·42	37·50	31·77	13·35	7·98	11·95	21·45	24·00	10·90	8·60	25·84	36·98	11·02
Noon.	37·42	38·24	32·45	14·60	8·70	12·29	21·22	22·61	8·47	9·83	28·35	38·97	12·17
P.M. 2	37·92	39·15	32·70	15·06	8·35	12·56	21·81	22·43	7·87	9·93	29·60	39·33	12·45
4	37·58	38·56	32·65	14·02	8·33	13·31	22·72	23·29	8·65	8·95	29·64	38·19	11·84
6	36·85	37·60	31·98	13·37	7·85	13·50	23·37	24·91	10·21	7·15	27·52	36·15	10·72
2	35·48	36·56	31·28	12·61	7·45	13·58	23·66	25·98	11·56	4·53	24·40	32·96	9·39
10	34·40	35·74	30·37	12·32	7·38	13·72	23·68	26·14	12·68	3·48	19·90	30·73	8·35
12	33·89	35·11	29·82	11·26	7·05	13·48	24·11	26·73	13·39	2·75	17·35	29·01	7·55
Means	+35·44	+36·58	+31·05	+12·70	+ 7·73	−12·93	−22·97	−24·93	−11·54	+ 5·48	+23·02	+33·88	+ 9·63

The mean temperature of the year in the Fury, from 4380 observations (sum 42183·8) is +9.63 Fahr.

Table XXV.—Means of the two preceding sets of observations in the Hecla and Fury.

Hour.	1821.						1822.						Mean temp. of each hour for the year.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	
A.M. 2	+32·77	+34·43	+30·22	+11·71	+ 7·34	−14·00	−23·85	−25·12	−13·50	+ 2·20	+14·84	+28·19	+ 7·26
4	32·91	34·82	30·40	11·58	7·43	14·19	23·92	24·96	13·53	2·07	16·45	29·20	7·51
6	33·76	35·45	30·62	11·95	7·47	14·10	23·44	24·84	13·03	3·96	20·84	31·08	8·47
8	34·83	36·62	31·13	12·72	7·91	13·89	22·72	24·36	11·69	6·30	23·14	33·89	9·66
10	36·48	37·78	32·36	14·07	8·32	13·43	22·19	23·12	9·72	9·74	26·24	36·25	11·23
Noon.	37·21	38·56	32·96	15·06	8·70	13·58	21·77	22·02	7·73	11·48	29·11	38·33	12·36
P.M. 2	37·95	39·16	32·99	15·34	8·58	13·90	22·08	21·81	6·98	11·38	30·11	37·89	12·55
4	37·70	38·89	32·99	14·59	8·49	14·40	22·76	22·65	7·74	10·19	29·84	36·92	12·01
6	36·83	38·05	32·43	13·98	7·98	14·59	23·39	23·95	9·67	8·23	27·27	34·81	10·84
8	35·78	36·89	31·86	13·28	7·73	14·85	23·76	24·85	11·07	5·40	24·15	31·97	9·55
10	34·43	36·15	30·99	12·75	7·46	15·03	23·87	24·98	11·65	3·72	19·77	30·36	8·51
12	33·68	35·51	30·38	11·91	7·17	15·01	24·27	25·30	12·36	3·14	17·60	29·17	7·80
Means	+35·36	+36·86	+31·61	+13·25	+ 7·88	−14·24	−23·17	−23·99	−10·72	+ 6·48	+23·29	+33·17	+ 9·81

The mean temperature of the year by this Table, from 8760 observations in Hecla and Fury (sum 85960·5) is +9·81.

Note.—Plate i., fig. 4, is projected from Table XXV., its last column being used also in the construction of Plate ii., fig. 7.

TABLE XXVI.—Showing the mean temp. for each alternate hour of the four seasons of the year 1821-22, at Winter Island, lat. 66° 11′ N. deduced from two sets of observations on board the Hecla and Fury, 4380 observations in each set.

Hours.	Autumn; Sep. Oct. Nov.	Winter; Dec. Jan. Feb.	Spring; March, April, May.	Summer; June, July, Aug.
	°	°	°	°
A.M. 2	+16·37	−20·85	+ 1·17	+31·83
4	16·42	20·89	1·66	32·35
6	16·63	20·66	3·92	33·46
8	17·20	20.19	5·91	35·13
10	18·20	19·46	8·62	36·85
Noon	18·86	19·01	10·94	38·03
2	18·93	19·18	11·50	38·33
4	18·65	19·81	10·77	37·85
6	18·09	20·54	8·73	36·58
8	17·59	21·03	6·17	34·91
10	17·02	21·17	3·95	33·68
12	16·44	21·40	2·79	32·82
Means.	+17·53	−20·35	+ 6·35$_5$	+35·15

TABLE XXVII.—Showing the mean temp. for each alternate hour for six summer and winter months, deduced from the same two sets of observations as the preceding table.

Hours.	Winter; Sep. to Feb. incl.	Summer; March to Aug. inclusive.
	°	°
A.M. 2	− 2·14	+16·49
4	− 2·14	17·00
6	− 1·91	18·69
8	− 1·39	20·52
10	− 0·52	22·80
Noon	+ 0·03	24·49
2	− 0·02	24·92
4	− 0·49	24·31
6	− 1·12	22·60
8	− 1·61	20·54
10	− 1·97	18·82
12	− 2·35	17·81
Means.	− 1·30	+20·75

NOTE.—Plate ii. fig. 4, is projected from table xxvi., and table xxvii. is used in the construction of plate ii. fig. 6.

TABLE XXVIII.—Containing the highest and lowest temperatures of each month, the means of the daily maxima and minima, separately and combined for the several months and the whole year, extracted from the Fury's register kept at Winter Island in 1821-22.

Month.	Highest temp. in the month.	Lowest temp. in the month.	Means of Maxima.	Means of Minima.	Means of Extremes.
	°	°	°	°	°
July .	+ 50·0	+ 29·0	+ 39·71	+ 32·27	+ 36·00
Aug. .	+ 48·0	+ 28·0	+ 40·81	+ 33·24	+ 37·02
Sep. .	+ 42·0	+ 20·0	+ 33·73	+ 28·10	+ 30·92
Oct. .	+ 32·5	+ 13·0	+ 17·03	+ 7·15	+ 12·09
Nov. .	+ 28·0	− 20·0	+ 12·08	+ 2·92	+ 7·50
Dec. .	+ 2·0	− 29·0	− 9·16	− 16·74	− 12·96
Jan. .	− 6·0	− 37·5	− 19·13	− 27·01	− 23·16
Feb. .	− 4·0	− 37·0	− 20·04	− 30·61	− 25·32
March .	+ 13·0	− 35·0	− 5·52	− 19·05	− 12·23
April .	+ 29·0	− 12·0	+ 11·78	− 1·27	+ 5·26
May .	+ 46·0	− 5·0	+ 30·98	+ 13·23	+ 22·10
June .	+ 50·0	+ 20·0	+ 40·78	+ 27·27	+ 34·02
Means.	+ 27·55	− 5·46	+ 14·58	+ 4·30	+ 9·44

The highest temperature noted in the year occurred on 19th June, at 4 p.m. + 50·0° F. The lowest temperature occurred in January, at midnight, on the 20th, and at 2 and 4 a.m. on the 21st, and was −37·5° F.

SECTION V.

Observations at Fort Franklin.

Though the thermometrical observations made at this place, owing to several accidental circumstances, did not extend to a complete year, and were not continued through the whole 24 hours, yet they are here inserted for the purpose of exhibiting, as far as they go, the great difference there is, even in the high latitudes, between the climate of a place in the interior and one on the sea-coast.

Fort Franklin stands on a gravelly bank near the outlet of Great Bear Lake, a very extensive sheet of deep water,; its latitude is 65° 12′ N.; its longitude 123° 13′ W.; and its altitude above the sea was vaguely estimated at about 230 feet. The ground rises gently to the northward or behind the fort, and an arm of the lake 4 miles wide lies in front. On the shortest day the sun, by calculation, ought to have been visible 2 h. 38 m., but the effect of refraction rendered the day considerably longer. The length of day on the 9th of December measured by the chronometer, was 3 h. 55 m., being 41 m. longer than it was calculated to be. On the 20th of June the sun by calculation remains 21 h. 41 m. above the horizon, exclusive of refraction. The rising ground to the north prevented the actual length of the day from being ascertained, but the red tints of the sun never left the sky in June. On the first of October, 1825, the first snow of the season fell, and on the 7th the last rain, the ground being at that time still unfrozen on the surface. The small lakes began to be covered with ice on the 9th of October, and after the 11th the snow continued to lie on the ground. On the 6th of December, Great Bear Lake was completely frozen over. In the end of March the snow, which was 3 feet deep, began to consume visibly in the sunshine without melting, and at this time there was light enough at four in the morning to read the scale of the thermometer in the open air. On the 10th of April the temperature was 40°, and for the first time in the season a thaw was perceptible in the shade. On the 11th melting snow dropped from the eaves of the houses, and patches of ground where the snow had been thin became bare. On the 11th of May the first spring shower fell, and on the 20th of the same month, the small rivers broke up. and snow was to be seen only in sheltered places, where it had drifted into wreaths in the winter. The mean temperature for the ten previous days was +37·5° Fahr. On the 8th of June a small lake about a mile across and 2 fathoms deep in the middle, broke up, having been frozen over 240 days; and on the 20th of the same month the ice of Great Bear Lake was broken up and began to drift down the river. The subsoil was perpetually

frozen on the banks of the Lake, the thaw at Fort Franklin at the end of the summer penetrating only about 20 inches.*

A spirit thermometer, hung on the north side of an observatory built of rough deal, was used for ascertaining the temperature from the commencement of the register till the end of May. After this time the sun rose and set so far to the northward, that it was difficult to find a situation for the thermometer free from the effects of radiation, and the following contrivance was therefore resorted to: the bulb and lower part of the scale of a mercurial thermometer were inclosed in two concentric cylinders, the inner one of brass, the outer one of tinned iron, but giving free admission to the air. This thermometer so protected, even when fully exposed to the sun, indicated as low, and frequently a lower temperature, than one hung up in the most shady place that could be found. The temperatures were ascertained by it for the remainder of the year. From the beginning of September till the end of May, the temperatures were carefully registered at four in the morning and at seven, and every succeeding hour till midnight. An occasional observation was also recorded at one A. M. In the spring an observation was also made at sunrise; the remaining hours were interpolated daily to give the true mean temperatures of the day and month. The time of observation was regulated by a chronometer, marking mean time. The observations for June were lost, and in July and August, the rest of the party being on the sea-coast, Mr. Dease registered the temperatures every three hours. Having lent his watch to the absent party, he could ascertain the time only by the position of the sun and a meridional line which had been traced to assist him. A second series of observations were made at the same place for nine months in the following year, when the temperatures were recorded every three hours; the results of this register are given in tables xxx. and xxxiv. By assuming + 48° as the mean temperature of June, and completing both registers by the addition of the same three summer months, the means of the two years do not differ more than a quarter of a degree, and the mean temperatures of the seasons, as appended to table xxxii., differ less than usual in two different years in the arctic regions. The springs of the two years coincide least, and these differ only $3\frac{1}{2}°$. It is very probable, therefore, that notwithstanding the unavoidable imperfections of the register, the mean temperature of + 17° or 18° assigned to Fort Franklin, is very near the truth. The curves of the different seasons are beautifully regular, as may be seen in Plate ii. fig. v.

* As Great Bear Lake maintains its level all the winter, though there is a constant discharge of water by the river, and the superficial supplies are cut off by frost, it is evident that the chief source of the water must come from the bottom of the lake at a greater depth than the frozen soil descends to. Now, taking the mean temperature at + 17°, this depth cannot be less than 400 feet.

TABLE XXIX.—Containing the daily and monthly mean temperature for one year (1825-26) deduced from observations made 19 times a-day for 9 months, and 8 times for July and August, at Fort Franklin, in Lat. 65° 12′ N.

Day.	1825.				1826.							
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.
	°	°	°	°	°	°	°	°	°	°	°	°
1	+39·82	+32·10	+27·04	+13·78	−43·60	−25·65	− 0·17	− 2·88	+24·25		+53·75	+47·96
2	36·79	28·90	+11·15	+10·23	−43·03	−10·23	− 8·02	− 1·42	23·08		57·67	45·37
3	39·48	31·44	+ 2·39	+17·61	−20·89	−15·13	−19·24	+ 4·51	10·45		50·01	49·40
4	41·42	31·36	− 2·75	+12·04	−23·21	−21·35	−21·13	− 1·86	14·00		57·31	51·63
5	45·04	31·22	−15·73	− 6·75	−26·65	−27·54	−14·37	0·00	31·15		52·56	55·90
6	44·07	35·13	− 1·72	−14·35	−33·04	−23·56	− 2·07	− 8·42	37·79		43·87	56·44
7	38·32	35·02	+ 3·18	−20·41	−27·33	−18·60	+22·62	−11·11	36·88		44·00	53·04
8	47·41	26·02	+ 5·71	−24·71	−17·74	−28·18	+ 1·53	+ 1·38	31·85		46·81	56·19
9	45·92	23·93	− 8·17	−36·21	−26·37	−20·80	− 3·29	+19·23	30·20		44·87	61·93
10	46·83	21·80	+ 8·14	−21·98	−35·36	−18·66	+ 5·84	+28·10	32·71		41·84	62·23
11	49·22	23·71	+ 1·94	− 9·56	−27·32	−23·13	−15·39	+28·38	34·00		51·59	61·47
12	43·15	24·00	− 6·40	− 8·32	−32·80	−29·54	−30·10	+18·98	35·62		52·88	51·15
13	43·92	25·21	− 8·99	− 6·57	−15·58	+ 5·04	−32·39	+14·12	38·12		53·56	50·44
14	44·53	24·01	−10·46	− 2·31	−15·05	+ 5·71	−21·62	+22·09	39·72		55·46	51·16
15	42·68	26·76	− 1·96	− 3·70	−11·27	+22·52	−22·40	+21·45	35·87		54·10	51·27
16	42·71	21·53	+ 1·08	− 7·44	−10·89	+ 3·72	− 8·71	+13·85	41·87		53·06	48·73
17	44·98	11·74	+10·99	−11·93	−15·33	− 9·73	− 5·55	+14·64	43·50		54·50	44·06
18	48·01	9·53	+11·42	−19·22	−32·90	− 7·32	−22·75	+29·20	35·97		52·77	44·37
19	45·45	9·34	+ 7.19	− 5·47	−33·52	−20·24	− 9·42	+29·87	36·17		53·00	48·40
20	47·59	18·28	+ 6·16	− 8·20	−24·72	−19·76	−11·54	+18·87	33·59		53·37	48·53
21	46·74	20·02	+ 5·07	−15·32	−18·45	−21·61	−13·76	+18·46	36·90		51·29	45·09
22	43·13	18·08	+ 4·30	−20·24	− 6·52	−19·79	+ 3·26	+12·65	39·53		50·15	43·61
23	40·49	18·20	+ 5·54	−33·91	− 7·82	−14·12	−16·69	+24·61	38·64		51·97	47·43
24	44·59	17·11	+ 9·48	−40·97	+ 2·54	+ 8·01	−16·28	+27·74	41·32		53·69	49·04
25	43·90	17·50	+ 4.64	−43·98	− 0·30	+11·60	− 8·73	+27·37	43·43		56·64	52·53
26	41·19	8·27	− 6·11	−37·95	−26·60	− 3·60	− 4·99	+27·39	46·91		61·50	49·81
27	40·39	−10·66	− 8·74	−31·83	−42·97	−15·81	+ 0·31	+20·47	47·91		60·56	49·84
28	36·39	− 1·47	− 6·29	−26·73	−37·69	−17·96	+ 6·48	+16·24	44·70		59·84	46·50
29	36·53	+10·55	+12·11	−12·86	−27·13	..	+ 3·40	+19·44	49·65		50·81	54·50
30	36·79	16·48	+23·65	− 9·71	−20·59	..	+ 0·20	+22·78	43·10		45·77	53·54
31	..	23·23	..	−17·81	−34·84	..	+ 9·09	..	47·32		45·85	50·56
Means	+42·92	+20·27	+ 2·79	−14·35	−23·78	−12·70	− 8·27	+15·20	+36·33	+48·02	+52·10	+50·56

TABLE XXX.—Results of a register kept at the same place every three hours, for part of 1826-27.

Means	+39·08	+24·67	− 3·01	− 7·42	−20·89	−20·80	− 2·50	+ 9·50	+34·02			

	°
Mean temperature of the autumn months, viz. Sept. Oct. Nov.	+ 21·97 F.
„ „ winter months, viz. Dec. Jan. Feb.	− 17·08 F.
„ „ spring months, viz. March, April, May	+ 14·42 F.
„ „ summer months, June, July, Aug. (imperfectly ascert.)	+ 50·41 F.
Mean temperature of the whole year 1825-6, about	+ 17·61 F.
„ „ of the year 1826-7. (Taking in three months, June, July, and August, of former year)	+ 17·89 F.
Mean temperature of 10 days about the winter solstice, 16—25th Dec. inclusive, 1825-26	− 14·79 F.
„ „ „ 1826—27	− 26·77 F.

* The register for June having been lost in a scuffle with the Esquimaux, cannot be supplied; but the mean assumed is not far from the truth. By including June, July, and August in the observations for 1826—27, the mean for the year as above stated is very near that of the preceding year. In both cases the mean of the year is deduced from the gross sum of the temperatures, not from the means of the months.

TABLE XXXI.—Containing the mean temperatures of 21 hours for 9 months, and of 8 hours for 2 months, from observations made at Fort Franklin in Great Bear Lake, in the year 1825-26, lat. 65° 12′ N.:—

Hour.	1825.				1826.								Mean of nine months.
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	
A.M. 1													
2											+44·71	+45·61	
3													
4	+42·36	+17·48	+1·43	−15·17	−25·21	−14·46	−15·50	+7·26	+30·51				+3·23
5	42·08	17·21	1·38	15·16	25·43	14·54	16·19	7·72	31·80		49·65	48·68	3·32
6	41·89	17·05	1·29	15·11	25·44	14·80	15·47	9·98	33·37				3·76
7	41·67	18·17	1·21	15·15	25·25	14·95	13·82	12·31	35·51				4·47
8	41·72	19·01	1·23	15·07	25·05	14·85	11·11	14·32	36·50		54·57	51·77	5·26
9	42·14	20·03	1·93	15·07	25·37	13·70	6·95	17·01	38·11				6·53
10	43·24	21·26	2·54	14·73	24·52	11·14	3·38	19·50	39·02				8·04
11	43·66	22·16	3·52	13·58	23·39	9·20	1·70	21·10	40·47		57·66	56·83	9·28
Noon 12	44·10	22·92	4·30	12·51	21·88	8·33	0·03	21·70	41·43				10·26
P.M. 1	44·61	23·58	4·83	12·05	21·48	7·72	+0·84	22·71	41·73				10·85
2	44·82	23·75	4·81	12·07	21·53	8·24	+1·71	23·21	41·65		59·02	56·88	10·96
3	44·13	23·69	4·66	12·96	21·89	9·35	+1·46	22·88	41·62				10·54
4	43·27	23·10	4·18	13·41	22·55	10·93	−0·16	21·97	41·17				9·70
5	42·92	22·39	3·63	13·40	22·56	12·59	2·89	20·48	40·65		54·69	52·66	8·82
6	42·71	21·48	3·17	14·04	22·56	13·06	5·80	18·87	39·47				7·88
7	42·64	20·58	2·84	14·11	22·55	13·21	8·44	16·42	38·20				7·00
8	42·64	20·16	3·05	14·49	23·44	13·57	9·92	14·85	36·80		50·66	48·89	6·29
9	42·39	19·75	2·95	14·74	24·06	14·02	10·84	13·32	34·65				5·55
10	42·71	19.42	2·82	14·95	23·95	14·11	11·30	12·29	33·68				5·24
11	42·72	19·16	2·77	15·75	23·95	14·24	12·58	11·32	32·57		45·81	46·95	4·72
12	42·64	18·85	2·46	16·44	24·25	13·72	13·53	10·33	31·58				4·29
Means.	+42·92	+20.27	+2·79	−14·35	−23·77	−12·70	− 8·27	−15·20	+36·33	+48·02	+52·10	+51·03	+6.55

In calculating the means of the months the hours left blank were interpolated, as well as 5 and 6 a.m.

NOTE.—Plate i., fig. v., was projected from table xxxi.

TABLE XXXII.—Showing the mean temperature of each hour of the autumn, winter, and spring seasons of three months, and of the winter half of the year, from September to February, both inclusive, at Fort Franklin, Great Bear Lake, in 1825-6:

Hour.	Autumn. *Sept. Oct. Nov.*	Winter. *Dec. Jan. Feb.*	Spring. *March, April, May.*	Six Winter Months, including *Sept.—Feb.*
A.M. 1				
2				
3				
4	+20·39	−18·41	+ 7·43	+1·10
5	20·19	18·50	7·97	0·95
6	20·25	18·57	9·29	0·94
7	20·32	18·57	11·32	0·99
8	20·63	18·44	13·29	1·20
9	21·35	18·19	16·05	1·69
10	22·34	16·99	18·36	2·79
11	23·11	15·60	19·94	3·86
Noon.	23·80	14·44	21·03	4·78
1	24·34	13·94	21·75	5·30
2	24·45	14·14	22·18	5·26
3	24·16	14·91	21·98	4·73
4	23·51	15·79	20·98	3·97
5	22·98	16·30	19·40	3·45
6	22·44	16·67	17·50	3·00
7	22·01	16·74	15·38	2·74
8	21·93	17·29	13·90	2·43
9	21·67	17·73	12·37	2·08
10	21·63	17·79	11·55	2·03
11	21·53	18·10	10·42	1·82
12	21·29	18·29	9·55	1·61
Means	+21·97	+17·08	+14·42	+2·55

The three hours left blank in the Table were interpolated to give the correct means of the seasons, contained in the bottom line.

Results of observations made every three hours in 1826—27:—

Means.	+20·33	+16·92	+10·96	+ 1·81

Note.—Plate ii., fig. 5, was projected from Table XXXII., its last column being used in a construction of Plate ii., fig. 6.

TABLE XXXIII.—Containing the highest and lowest temperature of each month, the means of the daily maxima and minima for the several months, and the means of these or of the extremes at Fort Franklin, in 1825-6.

Month.	Highest Temp. in the Month.	Lowest Temp. in the Month.	Means		
			of Maxima.	of Minima.	of Extremes.
1825.	°	°	°	°	°
Sept.	+60·5	+30·0	+48·12	+38·08	+43·10
Oct.	40·3	−18·0	+24·80	+14·82	+19.72
Nov.	32·5	−22·0	+ 8·39	− 3·72	+ 2·33
Dec.	27·5	−47·5	− 8·18	−21·63	−14·91
1826.					
Jan.	11·8	−49·0	−16·17	−31·25	−23·71
Feb.	27·8	−39·0	− 5·31	−21·71	−13·51
March	31·8	−43·0	+ 3·87	−22·01	− 9·07
April	41·6	−19·7	+24·83	+ 3·99	+14·41
May	61·0	+ 1·0	+43·89	+27·47	+35·68
June					
July	80·0	+34·0	+60·24	+42·64	+51·44
Aug.	74·0	+33·5	+58·21	+42·98	+50·60
Means of 9 months	+37·20	−23·02	+13·80	− 1·77	+ 6·00

TABLE XXXIV.—Containing similar results with the last Table, from a register kept at the same place every three hours, for part of the year 1826-27.

Month.	Highest Temp. in the Month.	Lowest Temp. in the Month.	Means		
			of Maxima.	of Minima.	of Extremes.
1826.	°	°	°	°	°
Sept.	+66·5	+ 5·0	+46·97	+31·20	+39·08
Oct.	47·0	0·0	+28·36	+21·67	+25·01
Nov.	20·5	−30·5	+ 0·26	−11·07	− 5·40
Dec.	22·5	−46·5	− 5·64	−15·03	−10·33
1827.					
Jan.	9·5	−52·0	−19·18	−29·51	−24·34
Feb.	21·0	−58·0	−17·16	−30·56	−24·14
March	21·0	−32·2	+ 3·51	−11·16	− 3·82
April	49·0	−26·0	+17·66	+ 2·83	+10·24
May	69·0	+ 4·0	+42·36	+25·68	+34·02
Means of 9 months	+36·22	−26·24	+10·79	− 1·77	+ 4·48

The highest temperature, excluding the month of June, occurred on the 12th of July, 1826 . . . . . +80·0 Fahr.

The lowest temperature in 1825-6 was on 1st January, 1826 . −49·0 Fahr.

,, in 1826-7 was on 7th February, 1827 . −58·0 Fahr.

On the 5th, 6th, 7th, and 8th of February, the thermometer never rose above . . . . . −40·0 Fahr.

SECTION VI.

On the Daily Progression of Temperature, or the Form and Character of the Annual and Monthly Daily Curve, at the several Places of Observation.

THE daily curves for the several years (1819-20, 1821-22, 1822-23, and 1824-25) at the respective places of observation in different parallels of latitude, are projected in Plate III., fig. 2, each point of the curve being the result of at least 365 or 366 observations; and where two sets of observations are conjoined, as at Winter Island and Igloolik, of double that number. The curves of mean temperature in these several parallels are so similar, that the few remarks that we have to make may be conveniently conjoined. In all except at Port Bowen, the temperature is lowest at 2 o'clock in the morning; it then increases till 2 in the afternoon, when it descends regularly till it reaches the minimum again. At Port Bowen the ascending and descending portions of the curve also occupy equal times, but the hours of observation being different, the minimum occurs at 1 A.M. and 1 P.M. respectively. Had the temperatures been recorded every hour or oftener, the times at which the maximum and minimum occur would have been ascertained more exactly, but it does not follow that the proportions between the ascending and descending branches of the curve would have been changed. At Leith the minimum occurs between 4 and 5 in the morning, and the maximum at 3 in the afternoon, the period of the ascent being 9 hours, 40 min., and of the descent 14 hours, 20 min.; or nearly in the ratio of 2 : 3. While at Plymouth the temperature ascends for 8 hours, from 5 A.M. to 1 P.M., and descends 16, or in the ratio of 1 : 2. An increase of latitude, though (as far as we can judge from a few examples) it renders the branches of the curve more nearly of equal length, does not appear within certain limits to alter the hour of the minimum, that being 5 A.M. at both Leith and Plymouth, which are 6° of latitude apart, while at Winter Island and Melville Island, which are $8\frac{1}{2}$° apart, the minimum at both is at 2 A.M.

The daily curves for the months are projected in Plate I., and the curves for the seasons of 3 months each, in Plate II. Plate III., fig. 1, exhibits the curves of the summer and winter halves of the year. On examining these plates we observe the flatness of the curves of the winter months, and at places where the sun is absent for many days about the winter solstice, their irregularity. The autumn curves are nearly as flat as the winter ones, and the spring curves are the sharpest and boldest of all. The first spring month, March, has the morning and evening parts of its

curve running in the horizontal and irregular manner of a winter curve, while its meridian portion rises rapidly from 6 in the morning till 2 in the afternoon, descending again till about 8 P.M. The other two spring months have the elevated part of their curves successively wider in proportion to their nearness to the summer solstice, so that they would include each other and be included by the summer curves which are fuller and broader. June retains more of the spring form than the other two summer months. The change from the full broad August curve to the flattish and often irregular September one is abrupt. The smallness of the mean hourly range of the autumn months is very striking when contrasted with the spring months, whose curves show that the mornings are cold and the mid-days hot. The daily range spoken of in Section IX. has no direct relation to the hourly curve for a month or longer time,—the mean daily range being often great in the autumn and winter months.

Sir David Brewster, in commenting on the Leith observations remarks that they form three groups. 1. The *curves of high temperature* being those of June, July, August, and September; the *curves of low temperature* being those of November, December, January, February, and March; and the *curves of moderate temperature* those of April, May, and October. In the projections of the arctic curves of temperature, there is no such distinct grouping marked by intervening free space. The three summer months are indeed clustered at one end of the scale, and the winter ones at the other, but the autumn and spring months generally alternating with each other, fill up the vacancy between them, and even cut both groups. Of the two equinoctial months, September and March, the former lies near or among the summer curves, and the latter has the same relation to the winter groups; its lowest limbs cutting them, or sometimes, as at Port Bowen, descending below the whole group. October in most cases is immediately above the mean annual curve, and April just below it, there being an exception in the case of Melville Island, where the October curve lies below the line of mean temperature. The curve for November has a more uncertain position, being sometimes mingled with the winter group, and at other times so high as to cut the mean annual curve. May (which in this point of view, that is its connexion with the sun's declination, pairs with November) has its curve running more uniformly about midway between the mean temperature and the summer group.

In the Tables from which Plate II., fig. 6, was projected, I have included September with the winter months and March among the summer ones (contrary to what Sir David Brewster and Mr. Snow Harris have done), their types in the arctic regions requiring this arrangement. Even at Leith and Plymouth, the March curve has

much of the spring character, though September at these places departs less from the summer type than in the higher latitudes of North America. On consulting Plate ii., fig. 6, the very great difference between the mean summer and winter temperatures of places situated within the arctic circle, becomes apparent; and these curves would have been still more widely separated had September been added to the summer months and March to the winter ones. These cold winters and warm summers are the chief characteristics of a severe or continental climate. At Leith and Plymouth, which have a purely maritime climate, these curves stand much nearer to each other in the scale of temperature.

SECTION VII.

On the Determination of the two times of the Day when the Mean Temperature occurs.

As the curve of daily temperature on the average of a month or longer period, has been shown by the tables and plates referred to in the preceding section, to rise in a regular manner from a minimum occurring at some hour in the morning, to a maximum at or after noon, and from thence to descend until it reaches the minimum again, it is evident that it must cut the horizontal line of the mean heat twice, once in the morning and once in the evening, the only exception being in the winter months of the high latitudes, when, during the absence of the sun, the curve of temperature occasionally departs from this regular course. No such irregularity, however, is observed in the curve for the whole year, and the determination of the exact times of mean temperature for that period is of much importance. When correctly ascertained we are furnished with the two best times of the day for recording the indications of thermometers; and even from one observation daily, continued for a year, the same result may be obtained as from 24 observations every day. Sir David Brewster remarks that at Leith the ascending or morning branch is more regular in its progression than the descending or evening branch, and that on this account, a single observation made every day at the time of the morning mean, is to be preferred to a single observation made every day at the time of the evening mean. Tables xxxv. and xxxvi. show the time of the mean temperature for the months, seasons, half-year, and whole year, at various places, the times for Leith and Plymouth being added from the papers of Sir David Brewster and Mr. Snow Harris.

Not being competent to discuss a question involving an acquaintance with the higher branches of mathematics, my object in the

few remarks that I think necessary to make is, merely to point out the more obvious results of the tables constructed from actual observations, and not to base upon them any reasoning upon the general distribution of heat upon the earth's surface; but it may assist the general reader to have placed before him a quotation or two on the subject from eminent authorities. Sir John Herschel states that "the temperature of any part of the earth's surface depends mainly, if not entirely, on its exposure to the sun's rays. Whenever the sun is above the horizon of any place, that place is receiving heat; when below, parting with it, by the process called radiation; and the whole quantities received and parted with in the year, must balance each other at every station, or the equilibrium of temperature would not be supported." * We learn also from the popular treatises on astronomy that, as the whole duration of daylight, or at least the amount of time in which the sun is above the horizon throughout the year,† is very nearly the same at every place on the earth's surface, the difference of the heating effect of his rays in different parallels of latitude must be due to the difference of his average elevation at these places, and must consequently decrease in approaching the poles. And, again, in reference to summer heat alone, though the length of the day increases with the latitude, the altitude of the sun causes fewer rays to strike the earth's surface;‡ but it has not yet been ascertained in what degree these opposite tendencies counteract each other.

The results of calculation are not, however, of themselves sufficient to indicate the climate of any place, experience having shown that the mean heat of different places on the same parallel of latitude is very various. And it is by observation alone that we can determine the effect of local causes, such as the absolute elevation of the country above the sea-level, the neighbourhood of lofty ranges of mountains, the extent of continent with which it is connected, its position, whether near the eastern or western shores of that continent, the existence of large lakes in its vicinity, the geological constitution of the soil, its drainage, and the average moisture of the atmosphere, &c. One object which I had particularly in view in undertaking to discuss the arctic observations was, to elicit the differences between a severe or con-

* Treatise on Astronomy, p. 196.—Soc. for Diff. of Useful Knowledge.

"As the intense heat supposed to exist in the centre of the earth might be thought capable of influencing the surface, it may be sufficient to say that M. Fourier, in a paper written to demonstrate the existence of this interior heat, informs us that it may be proved from the laws of refrigeration that at the present time the effect of central heat in raising the temperature of the surface above the value, which the action of the sun alone would give it, has become almost insensible."—*Ed. Phil. Jour.* xiv. p. 117.

† The effect of refraction in the high latitudes is mentioned in the following page.

‡ Astronomy, by the Society for the Diffusion of Useful Knowledge, p. 28.

tinental climate, and that of the maritime stations of Leith and Plymouth.

A circumstance particularly affecting the arctic observations, and especially in the spring, must not be left unnoticed, viz., *refraction*. The effect of this in accelerating the appearance of the sun and retarding his disappearance, has never been overlooked, but the full amount of it at very low temperatures has scarcely been generally acknowledged. Mr. Fisher informs us that at − 28° Fahr. he found the horizontal refraction to be 2° 30′, or with the addition of the apparent dip, nearly three degrees. At 58° or 60° Fahr. the refraction must have been very much greater. The mean temperature of several of the winter months at Sir Edward Parry's different wintering places is as low as that of the day on which Mr. Fisher observed as above quoted; and Barentz, who wintered in latitude 76° N., saw the sun when it required more than $4\frac{1}{2}^{\circ}$ of refraction to render it visible. At Melville Island, the period of the sun's absence at the winter solstice was actually shortened nearly a fortnight by refraction.

At Fort Franklin, the vicinity of so large and deep a body of water as Great Bear Lake must influence the mean heat in two ways. Notwithstanding the general fact quoted from M. Fourier, (in p. 33) the constant supply of water from a stratum low enough to be influenced by the central heat of the earth must affect the temperature of the neighbourhood, particularly in the autumn and beginning of winter. This great lake was not frozen across till nearly two months after the shallower pieces of water near it were set fast. In summer again, when the ice on the lake, then nearly six feet thick, was broken up, it was carried off by the current into Mackenzie River, without contributing by its dissolution to lower the summer temperature of the place where it was generated, though the autumnal cold must have been tempered in a certain degree, however small, by the heat necessarily set free as the water passed from a fluid to a solid state.

Most travellers into the arctic regions concur in fixing the time of the greatest cold at sunrise or shortly before it; and there is reason to believe that this opinion is substantially correct in the spring months; but further observation is wanted to establish it as a general rule in the other seasons. Reasoning on theoretical grounds, we might be led to conclude that the rule is true wherever the sun sets, for the terrestrial radiation going on during the absence of that luminary must tend continually to lower the temperature. But the amount of radiation is greatly influenced by the clearness of the sky; and it was often remarked at Fort Enterprise, that a clear sky soon after sunset was accompanied by a brilliant *aurora borealis*, and that this seldom continued beyond midnight or one in the morning, when it was superseded by fleecy

clouds obscuring the blue sky. It often happened that shortly before sunrise the sky again cleared, and it was almost always much colder to the sensations at that time than at any other hour of the night. It would be interesting to ascertain whether, when the sun does not set, the temperature be lowest soon after midnight. Sir Edward Parry's observations are not sufficiently frequent to determine this point. At Melville Island and Igloolik, the temperature is lower at 2 A.M. than at midnight, and at Port Bowen at 1 A.M. than at 11 P.M., during the summer months. Another point necessary to mention is, the very great clearness of the atmosphere in the high latitudes of North America, contrary to the popular notion which envelopes all these countries in perpetual fogs. We found this to be the case during four winters spent in the interior, and Sir Edward Parry has borne testimony to the same effect on the coast. Fogs are prevalent only when the ice is breaking up or drifting about.

Prefaced by these observations, table xxxv., containing the leading points of the *annual daily curve*, may be allowed to speak for itself. It will be seen that the greatest difference between the British and North American observations, is in the length of the interval between the minimum and morning mean, or in other words, the rapidity of the morning ascent of temperature, the rise being more rapid in the lower latitudes. The length of the interval between the evening mean and minimum is affected in the opposite way, though rather less regularly by a decrease of latitude. The intervals between the morning and evening times of mean temperature are much more nearly equal—their lengths at Melville Island and Plymouth, lying 24° of latitude apart, differing only about one-eleventh, while the intervals contained in the two last columns of the table, being those mentioned above, vary one-half of their amount.

TABLE XXXV.—Showing the critical points of the daily curve of temperature at various places.

Place.		Time of				Interval between				
Name.	Lat.	Minimum temp.	Morning mean temp.	Maximum temp.	Evening mean temp.	Minimum and following Maximum.	Maximum and following Minimum.	Morning and evening mean.	Minimum and morning mean.	Evening mean and Minimum.
	° ′	A.M. h. m.	A.M. h. m.	P.M. h. m.	P.M. h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville I.	74 12	2 00	8 41	2 00	8 27	12 00	12 00	11 46	6 41	5 33
PortBowen	73 14	1 00	7 27	1 00	6 50	12 00	12 00	11 23	6 27	6 10
Igloolik .	69 20	2 00	8 10	2 00	7 25	12 00	12 00	11 15	6 10	6 35
Winter I..	66 11	2 00	8 11½	2 00	7 36	12 00	12 00	11 24½	6 11½	6 24
Leith . .	55 56	5 00	9 13	2 40	8 27	9 40	14 20	11 14	4 13	8 33
Plymouth	50 21	5 00	8 09	1 00	7 00	8 00	16 00	10 51	3 09	10 00

As Table XXXV. applies to the mean results of a whole year, and not to a less period of time, the hours of mean temperatures are given for the months in Table XXXVI., and for the seasons of three and six months in Table XXXVII. The effect of declination in producing a variation of the hours can be clearly traced on comparing one month with another of the same year, though less regularly, from the various causes already enumerated in the high latitudes, than at Leith or Plymouth; but even at the latter places the gradation does not appear to be perfect. Greater accuracy would most probably be obtained were the observations made by apparent time instead of mean time. When the equation is considerable and the apparent time is earlier than the mean, the effect of registering by the latter is the same as an increase of declination, and *vice versâ*. To render the investigation of Tables XXXVI. and XXXVII. more easy, the intervals, as calculated from them, are given in Tables XXXVIII. and XXXIX.

TABLE XXXVI.—Showing the hours of morning and evening when the mean monthly temperature occurs.

Place.	Lat.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
		A. M.											
	° ′	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville Island	74 12	9 01	8 42	6 37	9 49	..	8 54	8 46	8 37	9 7	7 59	7 43	7 42
Port Bowen .	73 14	8 03	7 38	2 58	0 29	8 08	5 20	7 57	7 30	7 00	6 26	7 31	8 28
Igloolik . .	69 20	7 51	8 28	..	8 23	9 14	9 8	8 52	8 27	8 00	7 34	7 09	8 19
Winter Island.	66 11	8 47	8 47	7 31	1 31	6 45	8 36	8 59	8 06	8 04	7 29	8 39	8 25
Fort Franklin .	65 12	9 37	9 12	10 15	10 20	10 40	9 23	8 41	8 20	7 50	..	..	..
Leith . . .	55 58	8 52	9 25	9 39	9 56	10 34	10 02	10 10	9 01	9 14	9 07	8 55	9 00
Plymouth	50 21	8 09	8 23	8 54	9 14	9 22	9 23	8 36	7 52	7 39	7 50	7 21	7 51
		P. M.											
	° ′	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville Island	74 12	10 13	5 51	10 15	..	5 59	5 59	7 45	8 7	9 3	8 25	8 17	7 16
Port Bowen .	73 14	7 15	7 13	5 17	0 49	7 40	5 04	6 07	6 56	7 16	7 08	6 51	8 23
Igloolik . .	69 20	7 18	6 35	4 23	4 00	5 47	6 03	7 19	7 49	7 50	8 24	7 15	7 34
Winter Island.	66 11	8 34	8 07	6 48	3 21	5 18	6 05	7 30	7 14	8 23	7 09	8 37	8 05
Fort Franklin.	65 12	5 00	7 44	10 36	7 38	5 33	5 14	6 56	7 47	8 13	..	..	..
Leith . . .	55 58	8 18	6 48	7 41	6 15	6 57	6 56	8 08	8 26	8 40	8 24	8 40	8 19
Plymouth . .	50 21	6 28	6 15	7 20	5 20	7 16	6 39	6 58	6 47	7 25	7 21	7 25	7 23

TABLE XXXVII.—Showing the hours of morning and evening when the mean temperature of four quarters of the year, of the summer and winter halves, and of the whole year, occurs.

Place.	Lat.	Autumn 3 Mo.	Winter 3 Mo.	Spring 3 Mo.	Summer 3 Mo.	Winter 6 Mo.	Summer 6 Mo.	Whole Year.
		A. M.						
	° ′	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville Island	74 12	8 46	9 40	8 50	7 43	9 12	8 35	8 41
Port Bowen .	73 14	8 39	3 00	7 30	7 01	7 35	7 26	7 27
Igloolik . .	69 20	7 34	8 56	8 27	7 30	8 12	8 07	8 10
Winter Island.	66 11	8 40	7 23	8 19	8 01	8 12	8 12	8 12
Fort Franklin .	65 12	9 33	9 55	8 24	7 12?	9 47	8 01?	8 54?
Leith . . .	55 58	..	..	..	..	9 57	9 01¼	9 13
Plymouth . .	50 21	8 26	9 18	8 01	7 33	8 50	7 48	8 09
		P. M.						
	° ′	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville Island	74 12	8 40	10 24	8 26	8 09	10 04	8 13	8 27
Port Bowen .	73 14	2 20	4 18	6 42	7 23	6 24	6 45	6 50
Igloolik . .	69 20	5 48	5 46	7 41	7 59	5 47	7 42	7 25
Winter Island.	66 11	8 13	5 27	7 52	7 43	6 44	7 48	7 36
Fort Franklin.	65 12	7 30	7 26	7 39	7 12?	7 37	7 34?	7 35?
Leith . . .	55 58	..	..	..	..	7 09	8 28	8 27
Plymouth . .	50 21	6 25	6 30	7 01	7 21	7 09	6 37	7 00

TABLE XXXVIII.—Showing the length of the interval between the morning and evening hours of mean temperature for each month of the year, deduced from table xxxvi. :—

Place.	Length of Shortest Day.	Length of Longest Day.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.
			h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
Melville Island	Sun abs. 84 days	Sun above hor. 102 days.	..	9 09	..	..	..	9 05	10 59	11 30	11 56	12 26	12 34	11 34
Port Bowen	do. 84 days	..	11 12	11 35	14 19	..	11 32	11 44	10 10	11 26	12 16	12 32	11 20	11 55
Igloolik	do. 38 days	do. 60 days	11 27	10 07	..	7 37	8 33	8 55	10 27	11 22	11 50	12 50	12 06	11 15
Winter Island	0	24 hours	11 47	11 20	11 17	..	10 33	9 29	10 41	11 08	12 19	11 40	11 58	11 40
Fort Franklin	3h. 10m.	nearly 24h.	..	10 32	..	9 18	9 53	..	10 15	11 27	12 23	..	..	..
Leith	h. m. 6 52	h. m. 17 32	11 26	9 23	10 02	8 19	8 23	8 54	9 58	11 25	11 26	11 17	11 45	11 19
Plymouth	..	..	10 19	9 52	10 26	8 06	9 54	9 16	10 22	10 55	11 46	11 31	12 04	11 32

TABLE XXXIX.—Showing the length of the interval between the morning and evening hours of mean temperature, for four seasons, the summer and winter halves of the year, and for the whole year, deduced from table xxxvii.

Place.	Three months.								Six months.				Whole year.	
	Aut.		Winter.		Spring.		Summ.		Winter.		Summ.			
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.		
Melville I.	12	00	12	00	12	00	12	00	12	00	12	00	12	00
Port Bowen	11	41	13	18	11	12	12	22	11	49	11	19	11	23
Igloolik	10	14	8	50	11	14	12	29	9	35	11	35	11	15
Winter I.	11	33	10	04	11	33	11	42	10	32	11	36	11	24
Fort Frank.	10	03	9	41	11	15	12	00	9	50	11	33	11	41
Leith									9	42	11	26	11	14
Plymouth	9	59	9	12	11	00	11	48	10	19	10	45	10	51

SECTION VIII.

On the Relation between the Mean Temperature of the 24 Hours and that of any Single Hour, or any similar pair of Hours.

Mr. Snow Harris found that at Plymouth the mean annual temperature of any hour of the day does not differ more than 5° from the mean annual temperature of the 24 hours; and Sir David Brewster found the differences at Leith to be 3° only. The deviation shown by the arctic observations is only $2\frac{1}{2}°$ or $2\frac{3}{4}°$, except at Igloolik, where it is $3\frac{1}{2}°$, and in each case the excess of the maximum above the mean exceeds the defect of the minimum. Sir David Brewster states that the deviations are greater in the warmer years, which explains why its amount is less at Port Bowen than at Melville Island, the season passed at the former having been, according to Sir Edward Parry, a very ungenial one. The nearer the hours are to the times at which the daily curve crosses the mean line, the less of course is the deviation, and the more appropriate, as has been already remarked, for selection as the time for making a single daily observation throughout the year.

Table XL. is intended to show the deviations of the mean temperature of similar pairs of hours from that of the mean of the whole 24. From this table it appears that in the arctic registers the deviation of any pair of hours from the mean of the 24, is less than half a degree, and at the majority of the places of observation it does not exceed a quarter of a degree. The difference is greater at Leith, and still greater at Plymouth, being least at Melville Island, the most northerly place of observation.

Of all the similar pairs of hours, that of 4 and 4 are nearer to the average heat of the whole day at Melville Island, Winter Island, and Leith; and at Port Bowen and Plymouth, 9 and 9. The mean temperatures of the intermediate pairs as they are arranged in the table, are less than the annual mean of the 24 hours, and of the extreme ones greater at all the places of observation. The change from deficiency to excess, and the contrary, takes place twice in each column, and by considering the curves, as projected on Plate II., Fig. 7, it will be at once seen that 9 and 9 are the pair of hours which coincide most nearly with the times at which the curve crosses the line of mean temperature. The abscissa of one hour of each pair is above the mean line, and of the other below; the deviations, therefore, of the mean temperature of any pair from the mean must have a relation to variations in the form of the curve. At Igloolik, 10 and 10 approach within 100th of a degree of the mean heat, and 4 and 4 within 200ths.

TABLE XL.—Showing the deviation of the mean temperature of similar pairs of hours from that of the whole day, also the deviation of the annual mean of the extreme temperatures of each day from the real mean heat.

Hour.	Melville I.	Port Bowen	Igloolik.	Winter I.	Leith.	Plymouth.
1 and 1		+1·14			+0·37	+0·96
2 ,, 2	+0·12		+0·32	+0·09	+0·43	+0·63
3 ,, 3		+0·07			+0·34	+0·20
4 ,, 4	−0·01		+ 02	−0·06	+0·08	−0·33
5 ,, 5		−0·21			−0·13	−0·89
6 ,, 6	−0·12		−0·39	−0·16	−0·29	−1·11
7 ,, 7		−0·19			−0·35	−0·96
8 ,, 8	−0·13		−0·30	−0·21	−0·44	−0·66
9 ,, 9		+0·04			−0·32	−0·02
10 ,, 10	+0·17		+0·01	−0·08	−0·12	+0·40
11 ,, 11		+0·14			+0·11	+0·79
12 ,, 12	+0·17		+0·34	+0·27	+0·32	+0·99
Means of Extreme temp.	+1·64	+0·01	−0·08	−0·19		

The deviations of the means of the extreme temperatures for the whole year, from the true means, are placed underneath the columns appropriated to the arctic observations in this table, for the purpose of comparison.

SECTION IX.

On the average Daily Range for each Month and for the Year.

The measure of the daily change of temperature for each month, Sir David Brewster remarks, will bear some relation to the sun's declination; and the result of two years' observation at Leith showed that "it is nearly at its minimum about the winter solstice, and gradually increases till April, when it reaches its maximum; it then declines, and again rises to a second maximum in July, after which it gradually diminishes till the end of the season." His results are contained in the last column of the following table. The four first columns, embracing places within or close to the arctic circle, also exhibit the greatest range in April, but the minimum is mostly in September; and though at Melville Island and Winter Island there is an increase in July, this is not the case at the two other places. The range in the arctic winters is considerable, and during the absence of the sun is most likely due to the great amount of terrestrial radiation. At Fort Franklin, on clear nights, a thermometer with a blackened bulb always marked a lower temperature than one with a clean bulb. At this place the average range is greatest in March, and there is also a rise in July. The temperatures were recorded too seldom at Fort Enterprise, Cumberland House, and Penetanguishene, to give the correct range, and the two latter places are included in the table solely for the purpose of showing how much greater the range is in the severe or continental climate of North America than in the maritime one of Leith. The observations at Fort Reliance, situated at the east end of Great Slave Lake, were made by Sir George Back, and indicate an unusually great range, particularly in the winter months.

Tables XLII. and XLIII. are appended to XLI. merely to give a fuller view of the variations of an arctic climate.

TABLE XLI.—Showing the average daily range of temperature for each month, and for the whole year, at various places:—

Month.	Lat. 74°47′N. Melville Island, 1819-20; Hecla.	Lat. 73°14′N. Port Bowen, 1824-5; Hecla.	Lat. 69°20′N. Igloolik, 1822-3; Fury.	Lat. 66°11′N. Winter Island, 1821-22; Fury.	Lat. 65°12′N. Fort Frank. 1825-6 & 1826-7.	Lat. 64°28′N. Fort Enterprise, 1820-21.	Lat. 62° 46′ Fort Reliance 1833-4.	Lat. 53° 57′ Cumberland House, 1819-20.	Lat. 44° 49′ Penetanguishene, 1825-26.	Lat. 55° 58′ Leith, 1824 & 1825.
	°	°	°	°	°	°	°	°	°	°
Sep.	6·80	4·88	7·67	7·43	12·95	11·00		8·43	7·04	8·04
Oct.	9·94	7·81	8·34	7·56	8·33	9·10		11·60	10·45	4·87
Nov.	8·38	11·32	9·83	5·63	11·72	7·10	13·48	9·20	9·71	4·15
Dec.	10·05	7·84	7·31	9·88	6·42	7·70	15·36	8 80	6·45	2·31
Jan.	8·76	6·97	10 15	9·17	12·70	11·82	11·29	11·80	10·75	2·66
Feb.	8·36	8·89	12·20	7·55	14·64	12·50	20·72	13·10	11·13	3·57
Mar.	12·50	13·32	14·24	7·71	20·02	21·40	24·61	19·40	9·84	6·15
Apr.	17·02	16·72	21·27	10·57	17·83	23·50	24·94	17·00	8·77	10·63
May	14·19	13·27	16·73	13·53	16·55	22·50	19·56	18·30	17·73	8·58
June	8·13	10·58	16·51	13·05					12·90	8·26
July	12·25	8·10	11·32	17·76	17·60				8·50	9·67
Aug.	7·36	6·82	7·50	13·52	16·23				10·95	7·59
Whole Year.	10·28	9·74	11·87	10·28	14·30				10·53	6·14

TABLE XLII.—Showing the extreme range of temperature in one month:—

One Month.	64.0	57·0	67·0	51·0	113·4					

TABLE XLIII.—The extreme range in one year, or difference between highest and lowest temperatures recorded:—

Year.	110·0	98·5	104·0	87·5	129·0	131·5	135·0	134·0	124·0	

TABLE XLIV.—Showing the mean annual temperature of every second hour, as observed and calculated on the supposition of these being abscissæ of Parabolas; and containing also their differences.

Hours.	Melville I. Lat. 74¾°			Port Bowen, Lat. 73¼°			Igloolik, Lat. 69⅔°			Winter I. Lat. 66⅕°		
	Observ. Temp.	Calcul. Temp.	Diff.	Observ. Temp.	Calcul. Temp.	Diff.	Observ. Temp.	Calcul. Temp.	Diff.	Observ. Temp.	Calcul. Temp.	Diff.
	°	°	°	°	°	°	°	°	°	°	°	°
A.M. 1				+2·404	+2·404	0·000						
2	−0·915	−0·915	0·000				+2·781	+2·781	0·000	+7·259	+7·259	0·000
3				2·568	2·589	−0·021						
4	−0·803	−0·710	+0·093				3·001	3·089	−0·088	7·513	7·522	−0·009
5				2·988	3·144	−0·156						
6	−0·113	−0·094	+0·019				3·882	4·015	−0·133	8·473	8·324	+0·049
7				4·022	4·070	−0·048						
8	+0·880	+0·933	−0·053				5·544	5·556	−0·012	9·656	9·658	−0·002
9				5·384	5·425	−0·041						
10	+2·341	+2·465	−0·125				7·610	7·611	−0·001	11·231	11·252	−0·021
11				6·266	6·264	+0·002						
12	+3·346	+3·529	−0·173				8·957	8·874	+0·073	12·360	12·264	+0·096
P.M. 1				6·550	6·550	0·000						
2	+3·884	+3·884	0·000				9·295	9·295	0·000	12·551	12·551	0·000
3				6·243	6·291	−0·048						
4	+3·537	+3·643	−0·106				8·474	8·807	−0·333	12·012	12·202	−0·190
5				5·237	5·514	−0·277						
6	+2·626	+2·920	−0·294				6·763	7·342	−0·579	10·836	11·154	−0·318
7				4·256	4·227	+0·029						
8	+1·622	+1·715	−0·093				5·275	5·218	+0·057	9·555	9·505	+0·050
9				3·367	3·214	+0·153						
10	+0·560	+0·279	+0·281				3·840	3·862	−0·022	8·509	8·257	+0·242
11				2·677	2·607	+0·070						
12	−0·439	−0·617	−0·178				3·150	3·052	+0·098	7·798	7·508	+0·290
Mean Temp.	+1·378	+1·378	0·000	+4·330	+4·330	0·000	+5·714	+5·714	0·000	9·813	9·813	0·000

The dimensions of the semi-parabolas were determined by the following measures:—

M = Maximum temp. of daily curve : *m* = Minimum of ditto : *μ* = Mean of ditto.

Abscissæ.	1 and 2 $\mu - m$ B H	° m = 2·293 = 137·58	° m = 1·926 = 115·56	° m = 2·933 = 175·98	° m = 2·738 = 164·28
	2 and 4 M − μ G H	= 2·506 = 150·36	= 2·22 = 133·20	= 3·581 = 214·86	= 2·554 = 153·24
Ordinates.	1 Time between evening μ and m A H	h. m m = 5 33 = 333	h. m m = 6 10 = 370	h. m m = 6 35 = 395	h. m m = 6 24 = 384
	2 Time between morning μ and m C H	= 6 41 = 401	= 6 27 = 387	= 6 10 = 370	= 6 11½ = 371·5
	3 Time between morning μ and M C G	= 5 19 = 319	= 5 33 = 333	= 5 50 = 350	= 5 48½ = 348·5
	4 Time between M and μ evening E G	= 6 27 = 387	= 5 50 = 350	= 5 25 = 325	= 5 36 = 336

SECTION X.

On the Parabolic Form of the Four Branches of the Mean Annual Daily Curve.

[See Table XLIV., p. 372.]

The calculations contained in Table XLIV. were made after the subjoined formulæ given by Sir David Brewster, and the values of the symbols will be found at the bottom of that table. T is the required temperature at the given time, and y the ordinate corresponding to that time.

1. The *night branch* descends from the evening mean temperature to the minimum. The formula for calculating the temperatures of this semi-parabola is

$$T = m + \frac{HB \times y^2}{HA^2}.$$

2. For the *morning branch,* which ascends from the minimum to the morning mean,—

$$T = m + \frac{HB \times y^2}{CH^2}.$$

3. For the *noon branch,* which ascends from the morning mean to the maximum,—

$$T = M - \frac{GH \times y^2}{CG^2}.$$

4. For the *afternoon branch,* which descends from the maximum to the evening mean,—

$$T = M - \frac{GH \times y^2}{EG^2}.$$

Sir David Brewster gives also other formulæ, which, with their investigations, are given at length in his paper so frequently quoted by us. Mr. Snow Harris has made similar calculations for Plymouth by the same formulæ.

Of the Leith observations Sir David remarks that the greatest difference between the calculated parabolic abscissæ and the points of the curve ascertained by observation, is a quarter of a degree of Fahrenheit, and that the differences are most perceptible in the afternoon branch of the curve between 4 and 8 hours. Mr. Snow Harris also found the difference greatest at Plymouth in the afternoon branch, and amounting to eight-tenths of a degree, which he considers to be too great a deviation to allow that branch to be considered a semi-parabola. At the several arctic places of observation the observed points of the curve coincide more nearly

with the calculated abscissæ than either at Leith or Plymouth, the difference scarcely ever exceeding one-tenth of a degree, and sometimes falling short of one-hundredth of a degree. The variations are greater in the afternoon and evening branches, but except at Igloolik, they do not generally exceed a quarter of a degree, and even there, the greatest difference, which is at 6 P.M., is little more than half a degree. It is remarkable that the coincidence should be so great, considering the many sources of error peculiar to thermometric registers in the high latitudes.

SECTION XI.

Supplementary Tables.

The preceding pages contain all the information we could collect from the arctic registers of temperature, in furtherance of the objects indicated in Sir David Brewster's paper. But to give a fuller view of the climate in high latitudes a few tables are here subjoined, constructed from registers of temperature, too short and imperfect for deducing the annual daily curve, but yet interesting as far as they go.

The first table that follows contains the results of a thermometrical register kept on board the *Hecla*, in Hecla Cove, Spitzbergen, for three summer months in the year 1827, while Sir Edward Parry was absent on his memorable boat expedition. Hecla Cove is the most northerly position where a record of temperatures has been kept. Appended to the table are the results of Sir John Franklin's observations, made in the year 1818, when he commanded the *Trent*. As the ship was cruizing about the greater part of the time, it has not been thought necessary to calculate the summer daily curve, but the mean temperatures, being the result of 24 observations each day, are as correct as circumstances would admit, and are valuable as giving the summer heat at sea in very high latitudes.

Table XLVI. exhibits the results of observations made at Fort Enterprise on Sir John Franklin's first land expedition. The thermometer was often visited so as to ascertain pretty nearly the daily maximum and minimum; but the observations were not recorded sufficiently often at stated hours to serve for the projection of the daily curve.

TABLE XLV.—Results of a thermometric register for every second hour, kept on board the Hecla, at anchor in Hecla Cove, Spitzbergen, during the summer quarter of 1827 : lat. 79° 55′ N., long. 16° 49′ E.

Hour.	June.	July.	Aug.	Summer Quarter.
	°	°	°	°
A.M. 1	+ 34·45	+ 38·77	+ 37·45	+ 36·92
3	34·90	38·27	37·19	36·81
5	35·27	39·03	37·21	37·23
7	36·13	40·22	37·84	38·09
9	36·52	40·37	38·60	38·51
11	36·92	41·27	39·42	39·22
P.M. 1	37·37	41·68	39·82	39·55
3	37·17	41·11	39·71	39·35
5	36·47	41·16	39·13	38·94
7	35·28	40·56	38·53	38·16
9	35·38	40·03	38·08	37·86
11	34·48	39·58	37·87	37·32
Mean	+ 35·86	+ 40·17	+ 38·40	+ 38·15
Mean temp. of sea water	+ 31·50	+ 35·44	+ 36·83	+ 34·96

Highest temperature observed (July) + 55°
Lowest ditto (June) + 24

The temperatures taken on board the Trent, in 1818, when cruizing in a mean latitude of 80° N. and longitude 10° E. gave the following means :—

June.	July.	August.	Summer quarter.
°	°	°	°
+ 33·73	+ 35·98	+ 33·80	+ 34·52 Fahr.

TABLE XLVI.—Some results of a thermometric register kept at Fort Enterprise in 1820-21 : lat. 64° 28′ N., long. 113° 06′ W. ; supposed height above the sea level 850 feet.

Month.	Highest temperature recorded.	Lowest temperature recorded.	Means of		
			Maxima.	Minima.	Extremes.
1820.	°	°	°	°	°
Sept.	+ 53·00	+ 16·00	+ 39·30	+ 28·30	+ 33·80
Oct.	37·00	+ 5·00	+ 27·90	+ 18·80	+ 23·40
Nov.	25·00	— 31·00	+ 2·80	— 4·30	— 0·75
Dec.	6·00	— 57·50	— 25·80	— 33·50	— 29·65
1821.					
Jan.	20·00	— 49·00	— 9·68	— 21·50	— 15·60
Feb.	1·00	— 51·00	— 19·10	— 31·60	— 25·35
March	24·00	— 49·00	— 0·90	— 22·30	— 11·60
April	40·00	— 32·00	+ 16·40	— 7·10	+ 4·65
May	68·00	+ 8·00	+ 42·80	+ 20·30	+ 31·55
Means of a year	+ 22·83	— 20·42	+ 6·14	— 4·41	+ 0·86

The following table is compiled from Sir George Back's Appendix to his Journal, but, not having access to his original observations, I have been unable to compute the daily curve for the period,—which the observations, being 15 each day, were numerous enough to have enabled me to do.

TABLE XLVII.—Containing the daily and monthly mean temperatures for portions of the years 1833-34, at Fort Reliance, near the east end of Great Slave Lake. Lat. 62° 46′ N., Long. 109°. Supposed height above the sea, 650 feet.

Day.	1833.		1834.							1835.	
	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	Nov.	Dec.	Jan.	Feb.
	°	°	°	°	°	°	°	°	°	°	°
1	+16·03	+17·43	−48·82	−36·44	+12·57	− 9·61	+ 4·59	+29·58	−18·82	−36·07	−46·47
2	+25·61	+15·50	−46·17	−32·41	+27·11	+14·87	+19·13	+25·77	−41·15	−18·09	−36·03
3	+33·35	+ 9·71	−13·43	−44·64	+ 0·83	+33·68	+35·56	+19·61	−30·86	−21·57	−26·27
4	+28·68	+14·51	−17·03	−46·80	−13·69	+ 0·03	+35·59	+19·21	−43·24	−21·91	−17·32
5	+22·19	+16·32	− 5·70	−30·09	+00.49	+11·16	+33·31	+21·07	−38·30	−12·26	−26·79
6	+12·29	+ 3·58	−26·82	−12·77	−15·85	+ 2·24	+33·42	+ 8·16	−18·26	−13·91	+ 4·78
7	+24·48	−15·59	−26·80	− 2·53	−32·12	+ 8·05	+32·92	+26·20	−37·97	−21·37	+ 3·73
8	+23·71	− 8·24	−38·08	+ 7·16	−28·37	+ 7·34	+23·09	+24·32	−26·75	− 9·55	−15·62
9	+16·09	+14·26	−31·72	−27·57	− 9·92	+ 7·20	+14·61	+15·10	− 9·52	− 4·75	+ 7·40
10	+26·01	+12·57	−29·39	−26·87	+ 8·03	+20·06	+19·58	+ 2·87	+ 7·27	−21·15	− 1·30
11	+20·61	+13·01	−37·48	− 7·04	+ 0·95	+11·18	+29·21	−10·40	−10·82	−18·22	− 2·48
12	+12·73	+20·62	−48·08	+ 7·18	− 1·33	+ 8·32	+37·07	−16·44	−26·00	− 3·89	−19·29
13	− 2·83	+16·90	−54·75	−29·47	+ 2·50	+ 7·37	+45·85	−10·65	−16·57	− 0·80	− 7·80
14	+ 1·98	+ 7·64	−52·56	−28·51	+ 9·09	+ 9·57	+39·98	− 1·42	−29·25	−12·88	−24·86
15	+16·37	− 2·78	−47·08	−12·27	− 8·20	+20·72	+31·47	+17·25	−53·91	−20·94	−40·68
16	+10·28	+ 8·68	−60·33	− 3·08	−13·54	− 0·40	+37·09	+22·68	−35·88	−14·89	−43·05
17	+11·38	−10·77	−54·31	+ 5·71	−25·37	− 7·36	+24·71	+23·84	−26·21	− 6·45	−29·08
18	+15·37	+12·03	−39·63	− 6·88	−16·80	− 6·93	+27·77	+16·27	−27·88	−15·75	−35·22
19	+27·31	+14·29	−46·47	−23·74	−17·15	− 8·23	+32·44	+24·94	−37·99	−13·90	−30·41
20	+ 1·66	−18·91	−29·46	−28·35	− 0·94	+ 5·02	+39·74	+19·29	−48·58	− 4·71	−33·20
21	− 6·41	− 6·90	−42·63	−33·75	− 2·05	+ 8·18	+49·76	+18·40	−40·25	− 5·74	−44·64
22	+ 3·94	+ 8·93	−32·85	−26·02	−18·43	−13·48	+43·69	+19·45	−50·60	− 7·24	−35·01
23	+ 8·88	− 2·14	−19·42	+ 4·15	− 7·33	+20·38	+31·53	+ 8·40	−55·52	− 4·86	−43·85
24	+11·43	− 8·25	−12·13	+10·28	+ 9·48	+23·66	+35·18	+10·58	−31·74	− 5·96	−35·31
25	+22·06	−26·22	−14·56	+15·20	− 5·80	+43·23	+44·54	+18·72	−37·14	−17·77	−18·27
26	+ 4·16	+ 3·16	+16·06	+ 4·13	− 1·37	+12·05	+47·67	+11·68	−28·55	−25·10	−15·63
27	− 0·29	+ 0·42	−36·03	+ 3·21	−14·48	+ 3·90	+58·69	+ 9·43	−27·14	−23·20	−25·33
28	+15·15	−15·41	−44·46	+ 0·64	+ 1·15	+ 7·46	+61·36	+ 8·27	−34·16	−28·27	−14·60
29	+26.43	−35·53	−38·42	..	+ 5·02	+ 6·09	+42·99	+ 5·35	−50·04	−24·88	..
30	+16·03	−35·18	−35·79	..	− 3·20	+ 1·17	+44·83	−25·80	−36·17	−35·23	..
31	..	−48·20	−20·73	..	−15·23	..	+59·85	..	−43·52	−44·03	..
Means	+14·82	− 1·71	−33·39	−14·37	− 6·14	+ 8·23	+36·03	+12·05	−32·43	−16·62	−23·32

Mean temp. of winter quarter (*Dec., Jan., Feb.*) mean of 2 years' obs. . . . . −20·371 F.
„ „ spring quarter (*March, April, May*) 1 year 1834 . . . . . +12·755

The lowest temperature recorded in 1833-34 (Jan.) was . . . . . −70·00 F.
„ „ „ 1834-35 (Dec.) was . . . . . −58·00

The three following tables give the results of a thermometric journal kept at Penetanguishene, on Lake Huron, in lat. 44° 48′ N.,

long. 80° 40′ W., and 600 feet above the sea, by Mr. Todd, assistant surgeon, R.N.

TABLE XLVIII.—Showing the mean heat of each month at four several hours, and also the mean of one pair, 8 A.M. and 8 P.M.

Month.	8 A.M.	Noon.	3 P.M.	8 P.M.	Mean of 8 and 8.
1825.	°	°	°	°	°
May	+ 50·41	+ 60·06	+ 62·29	+ 53·55	+ 51·98
June	65·07	71·60	72·87	65·40	65·23
July	70·71	78·06	76·94	70·06	70·38
Aug.	67·16	72·16	73·64	69·93	68·54
Sept.	52·42	56·87	58·23	53·94	53·18
Oct.	44·81	52·26	53·42	46·90	45·85
Nov.	34·19	39·68	41·84	39·13	36·66
Dec.	23·00	25·52	26·16	24·94	23·97
1826.					
Jan.	19·29	24·55	26·16	23·48	21·38
Feb.	17·81	23·52	25·87	21·52	19·66
March	27·65	33·26	34·61	31·19	29·42
April	34·63	39·00	40·67	37·53	36·08
Means	+ 42·93	+ 48·05	+ 50·20	+ 45·52	+ 44·225

In the year 1820 the mean annual heat at 8 A.M. was + 45·42 °F.
„ 1823 „ 3 P.M. it was + 46·34 „

TABLE XLIX.—Showing the means of the maxima and minima of each month, and the means of the extremes.

Month.	Means of		
	Maxima.	Minima.	Extremes.
1825.	°	°	°
May	+ 63·96	+ 46·23	+ 55·09
June	74·30	61·40	67·85
July	77·40	68·90	73·15
Aug.	74·20	63·25	68·72
Sep.	58·45	51·41	54·93
Oct.	54·06	43·61	48·83
Nov.	42·71	33·00	37·85
Dec.	27·61	21·16	24·38
1826.			
Jan.	27·87	17·12	22·50
Feb.	26·80	15·67	21·23
March	35·74	25·90	30·82
April	41·83	33·06	37·48
Means.	+ 51·24	+ 40·69	+ 45·96

TABLE L.—Showing the mean heat of four seasons, and of the six summer and six winter months in 1825-26, at the same place.

Periods.	8 h. A.M.	Noon.	3 P.M.	8 P.M.	8 and 8.
	°	°	°	°	°
3 summer months	+ 67·67	+ 73·96	+ 74·50	+ 68·50	+ 68·03
3 autumn ditto	+ 43·82	+ 49·63	51·19	46·66	45·24
3 winter ditto	+ 20·11	+ 24·56	26·07	23·40	21·75
3 spring ditto	+ 37·60	+ 44·16	45·91	40·78	39·19
6 summer ditto	+ 52·63	59·06	60·21	54·64	53·64
6 winter ditto	+ 32·04	37·17	38·70	35·08	33·56

Penetanguishene is situated on a bank rising steeply from the beach of one of the sheltered bays of Lake Huron. Mr. Todd, in his remarks on its climate, observes, that the spring of 1826 was the earliest he had known during eight years' residence at the place. "In general," he says, "the snow remains on the ground till the latter end of April. In June or July the temperature occasionally rises to 92°, when the heat is oppressive to the sensations, and for the most part precedes a thunder-storm, after which the air becomes cooler. The atmosphere is clear in March; and the ice, which by that time has attained a thickness of 16 inches, begins to dissolve. Snow falls towards the end of October, and the harbour freezes over in the beginning of December." Mr. Todd once only observed the thermometer as low as −32°, which was for a few hours in January, 1822. The snow attains a depth of 3 feet in the course of the winter in the woods, but the ground beneath it is not frozen. He thinks that the greatest heat occurs at 3 P.M., and the least at 3 A.M.; but he did not ascertain the fact by a continuous series of hourly observations.

As the mean of the combined observations at 8 in the morning and 8 in the evening is, at Leith and Plymouth, less than the true mean of the 24 hours, but does not in either case differ from it more than $\frac{3}{4}$ of a degree, we cannot err much in considering the mean heat of the year 1825-26, at Penetanguishene, to be about 45° Fahr., or a little more, which corresponds nearly enough with the mean of the extreme temperatures, which is + 45°·96. This is about 3° below the mean temperature of Leith, although Penetanguishene lies upwards of 11° of latitude more to the southward. If we allow, with Dr. Dalton, a depression of 1° of temperature for every hundred yards of elevation above the sea, and augment the mean heat of Penetanguishene in that proportion, it will still be less than that of Leith; and even allowing, as

Mr. Nixon's experiments would lead us to do, a degree for 230 feet, we should only bring them to an equality.

I am indebted to the kindness of Captain Washington for the following highly valuable table of mean temperatures of ten different stations in Sweden, which furnishes the means of making a more extensive comparison between the temperature of Northern Europe and Arctic America. The table was drawn up by Colonel Forsell, of Stockholm, and by him communicated to the Geographical Society of London.

The original MS. is in the centigrade scale, which has been converted into that of Fahrenheit. I am unwilling to extend the length of the paper by mentioning the many interesting differences of climate pointed out, by contrasting this table, or one which may be compiled from it of the mean heat of the four seasons of the year, with those which precede it; and shall merely state generally that, under similar circumstances, the east side of one continent appears to have the advantage over the western shores of the other in the high latitudes, of about 20° of mean annual temperature, and that the isothermal line, in passing from Norway to America, is bent 12° of latitude to the southward. As, however, none of the pairs of places agree exactly in latitude or altitude, these quantities are to be considered as but roughly estimated.

TABLE LI.—Containing mean temperatures of various places in Sweden by Colonel Forsell, of Stockholm.

Months.	° ′ L. 55 42 Lund. Alt. 60 ft. No. 1.	° ′ L. 56 53 Wexiö. Alt. 500 ft. No. 2.	° ′ L. 57 42 Gotten-burg. No. 3.	° ′ L. 59 23 Carl-stad. Alt. 180 ft. No. 4.	° ′ L. 59 20 Stock-holm. Alt. 128 ft. No. 5.	° ′ L. 60 39 Falun. Alt. 400 ft. No. 6.	° ′ L. 62 38 Hernö-sund. No. 7.	° ′ L. 63 24 Oster-sund. Alt. 1050 ft. No. 8.	° ′ L. 63 50 Umeå. No. 9.	° ′ L. 68 30 Enon-tekis. Alt. 1467 ft. No. 10.
	°	°	°	°	°	°	°	°	°	°
Dec. .	+31·01	+28·66	+34·42	+27·30	+27·28	+24·15	+18·70	+20·95	+13·64	+ 2·44
Jan. .	28·51	27·86	29·99	25·60	24·32	18·68	16·32	9·25	11·60	0 12
Feb. .	29·10	28·18	30·11	28·42	25·86	23·30	17·04	15·30	14·98	1·92
March	32·36	30·68	34·25	31·26	29·58	28·55	23·78	25·72	22·18	11·52
April .	41·29	40·80	43·84	39·64	36·76	37·44	31·04	33·00	33·98	26·15
May .	51·69	53·12	53·02	50·30	48·26	47·46	42·38	43·38	43·28	37·20
June .	60·31	62·20	61·04	59·34	57·02	57·30	53·30	54·48	54·50	49·02
July .	63·25	66·04	64·08	63·44	63·46	60·35	58·64	57·90	61·24	58·10
August	62·64	63·12	61·28	60·80	60·80	57·34	56·25	55·96	56·70	56·72
Sept. .	56·17	54·30	55·90	54·18	53·65	50·62	47·48	45·24	47·66	42·06
Oct. .	47·01	44·48	48·66	43·90	44·18	43·68	39·24	39·40	38·25	27·45
Nov. .	37·90	35·42	38·65	35·32	35·38	30·22	28·50	29·08	27·10	11 75
Annl. Mean	+45·10	44·56	46·34	43·28	42·18	39·92	36·36	35·80	35·42	27·04

NOTE.—No. 1 is the result of 54 years' observations, from 1765 to 1818; No. 2 of 36 years, from 1786 to 1821; No. 3 of 46 years, from 1787 to 1832; No. 4 of 10 years, from 1815 to 1824; No. 5 of 15 years, from 1808 to 1822; No. 6 of 9 years, from 1830 to 1838; No. 7 of 30 years, from 1787 to 1816; No. 8 of 6 years, from 1823 to 1828; No. 9 of 9 years, from 1796 to 1804; and No. 10 of 5 years, from 1802 to 1806.

TABLE LII.—Temperatures at Yakuzk, Siberia, lat. 62° 1½′ N., deduced from many successive years of observation. (M. Erman.)

Hour.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
	°	°	°	°	°	°	°	°	°	°	°	°
6 A.M.	−42·92	−32·80	−44·50	−17·27	+ 8·15	+35·82	+54·27	+64·40	+57·22	+38·75	+11·30	−13·45
2 P.M.	−39·77	−30·77	−36·40	+ 1·63	+30·43	+47·30	+67·77	+79·70	+72·72	+50·00	+21·20	− 9·17
9 P.M.	−42·02	−31·90	−41·80	− 7·82	+17·15	+37·62	+53·60	+61·70	+58·32	+40·55	+13·33	−12·77

The annual mean at 6 a.m. is + 10·23°; at 2 p.m. + 21·54°; and at 9 p.m. + 12·47°; showing that the curve is much bolder than at Plymouth. The mean heat of the year is about + 14°.

TABLE LIII.—Of six months' temperatures, at two several hours, at Fort Vancouver, in the valley of the Oregon or Columbia. Lat. 45° 37′ N., long. 120° 50′ W.

Month.	7 A.M.	1 P.M.
1835.	°	°
Oct.	+44·48	+55·76
Nov.	37·13	43·60
Dec. 1836.	35·65	41·06
Jan.	35·33	39·51
Feb.	34·29	44·00
March.	40·45	56·42
Mean of 6 months.	+37·52	+46·22
Mean of 3 winter months.	+34·75	+40·99

The above table, compiled from the Journal of the Rev. S. Parker, serves, as far as it goes, to show the difference between the climate of the shores of the Pacific and that of the eastern coast of America. The heat at the hours of observation is much greater at Fort Vancouver than at Penetanguishene, the greater elevation of which is nearly compensated by its more southern position of 1° of latitude. The temperature at Fort Vancouver is, however, 10° less for the same three months than at Leith, which is 10½° of latitude farther to the north; and for the whole six months the difference is 13° of Fahrenheit. There is, however, reason to believe, that the summer heat is much greater on the Oregon than at Leith.

M. Baer states in a memoir on the climate of Sitka, which did not reach this country till after the preceding paper had been sent to the press, that in the 57th parallel of north latitude the mean annual temperature on the western coast of America is 18° F. higher than on the eastern coast, though still some degrees inferior to that on the western coast of Europe. This coincides with our remark in page 49 of the mean heat on the coast of Norway being 20° above that on the eastern shores of America in the same parallels.—Vide Bull. Sci. de l'Acad. de St. Petersbourg.—Baer, *Ueber des Klima von Sitka, &c.*

Plate 1. fig: 1.

Mean daily curves of temperature for the several months & the whole year, at Melville I.d Lat. 74, 47 N. deduced from Table III.

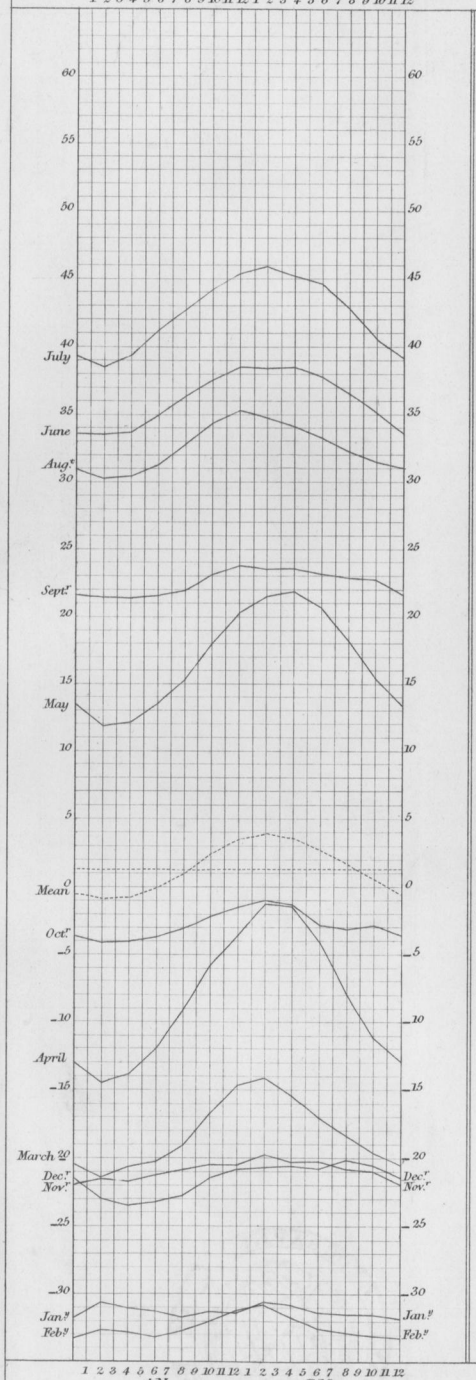


Plate 1. fig: 2.

Mean daily curves of temperature for the several months & the whole year, at Port Bowen, Lat. 73, 14 N. deduced from Table IX.

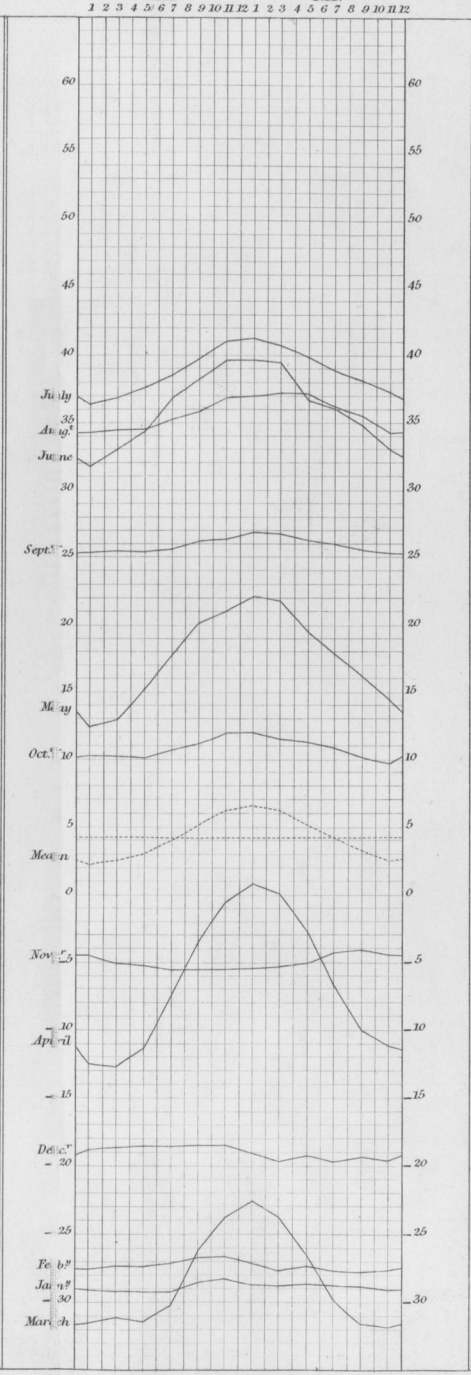
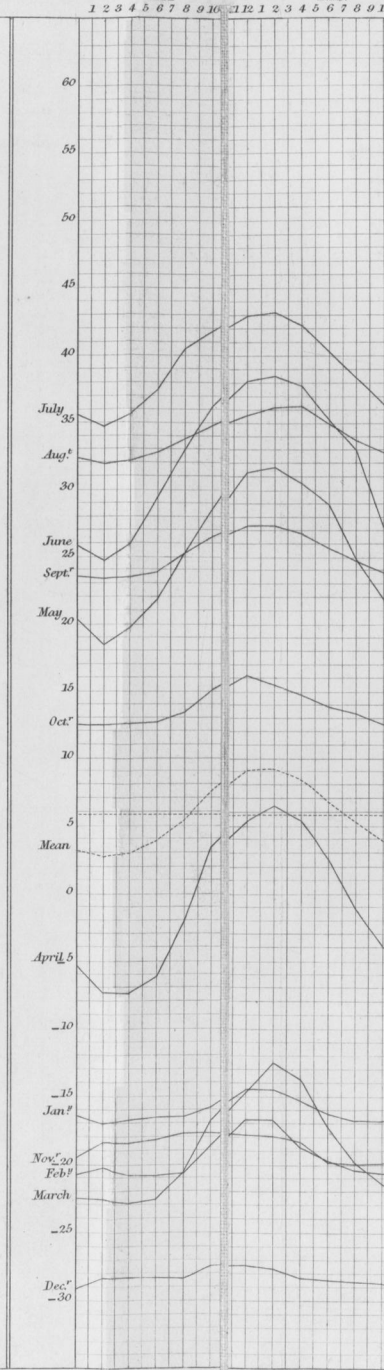


Plate 1. fig: 3.

Mean daily curves of temperature for the several months & the whole year at Igloolik Lat. 69.° 21' N. deduced from Table XVII.



June, July, Aug.t } Red. Sept.r, Oct.r, Nov.r } Yellow. Dec.r, Jan.y, Feb.y } Purple. March, April, May } Blue.

Pub.d for the Journal of the R.t Geog.l Society, by John Murra

Plate 1. fig. 3.

daily curves of temperature for the
ral months & the whole year at Igloolik
69°. 21' N. deduced from Table XVII.

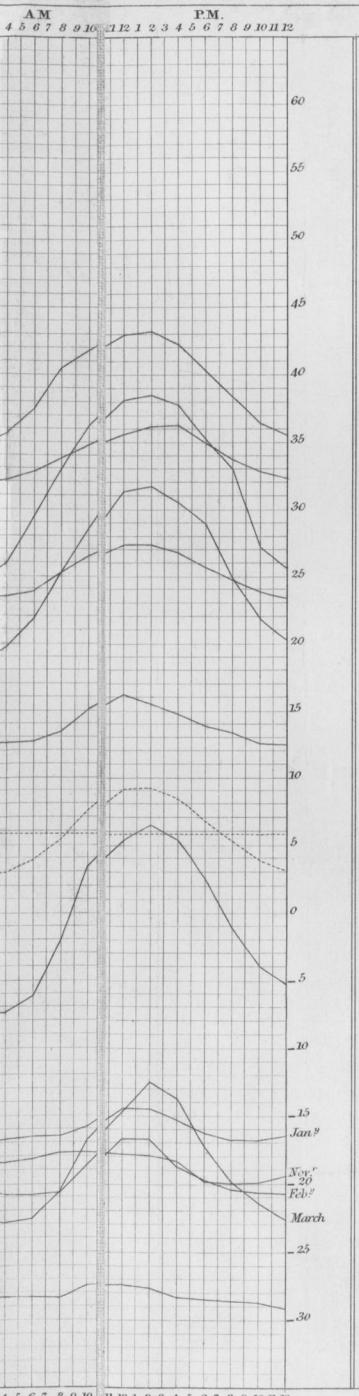


Plate 1. fig. 4.

Mean daily curves of temperature for the several months & the whole year at Winter I Lat. 66°. 11' N. deduced from Table XXV.

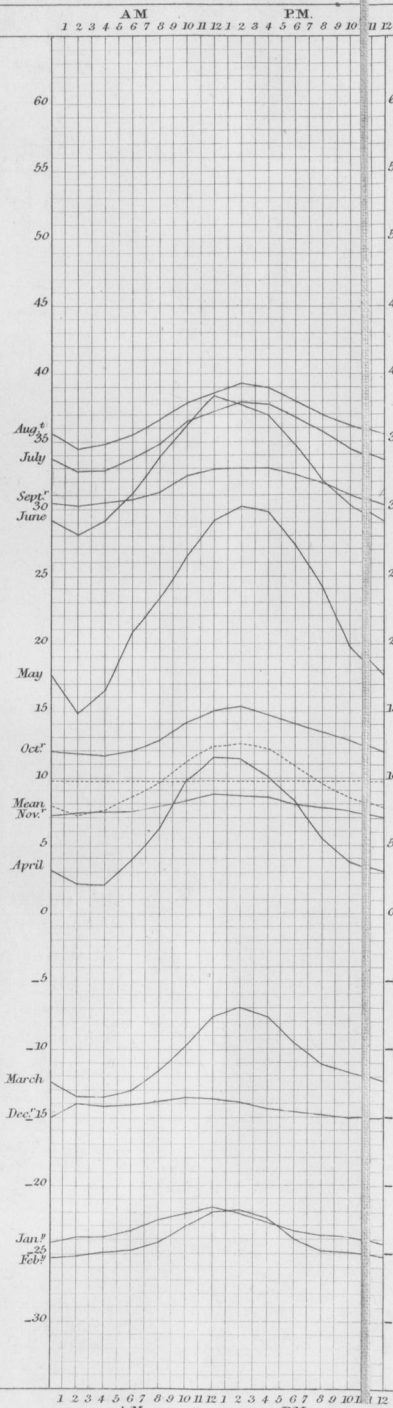
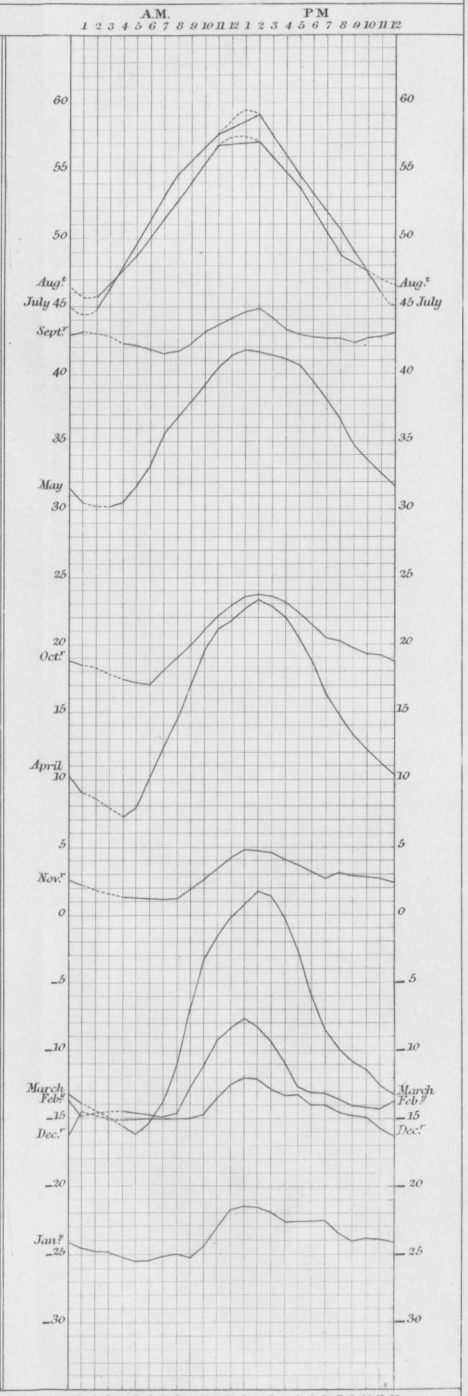


Plate 1. fig. 5.

Mean daily curves for Eleven months at Fort Franklin Lat. 65°. 12' N. deduced from Table . XXXI .



urnal of the R.t Geog.l Society. by John Murray. London. 1839.

John Arrowsmith.

Plate 2 fig.1.

Mean daily curves for four seasons of three months each at Melville 1d Lat. 74. 47 N. Year 1819-20 deduced from Table IV.

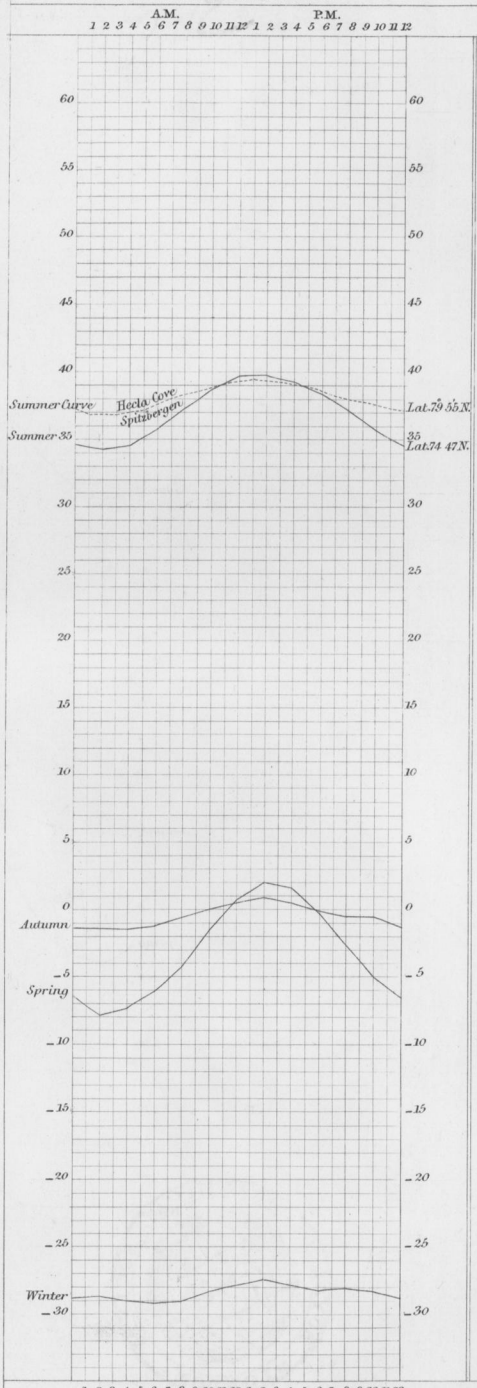


Plate 2. fig.2.

Mean daily curves for four seasons of three months each at Port Bowen Lat. 74.14 N. deduced from Table X.

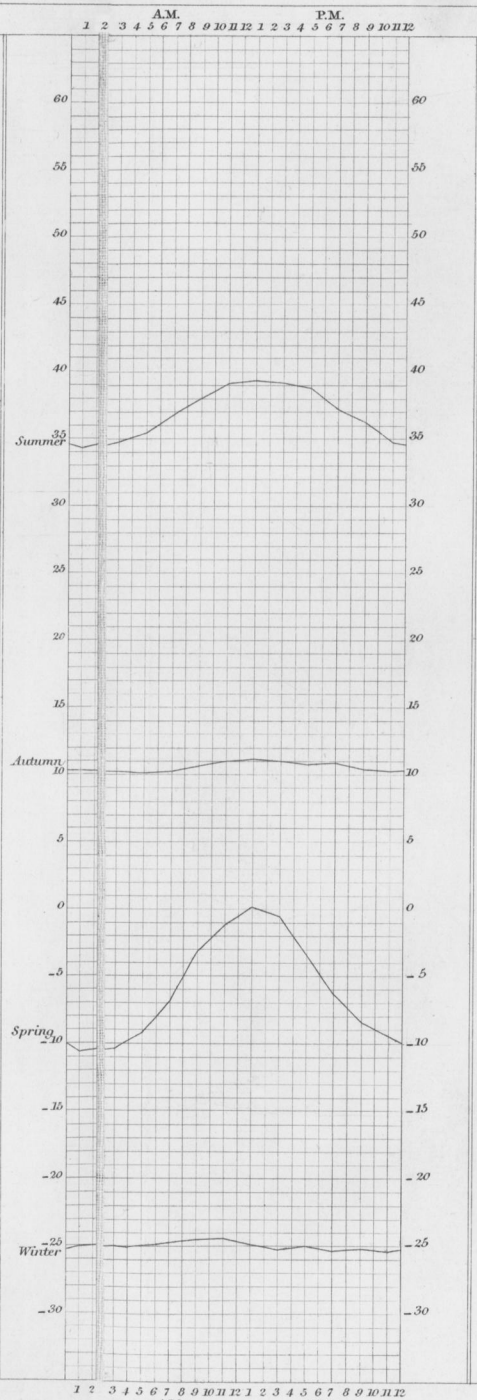
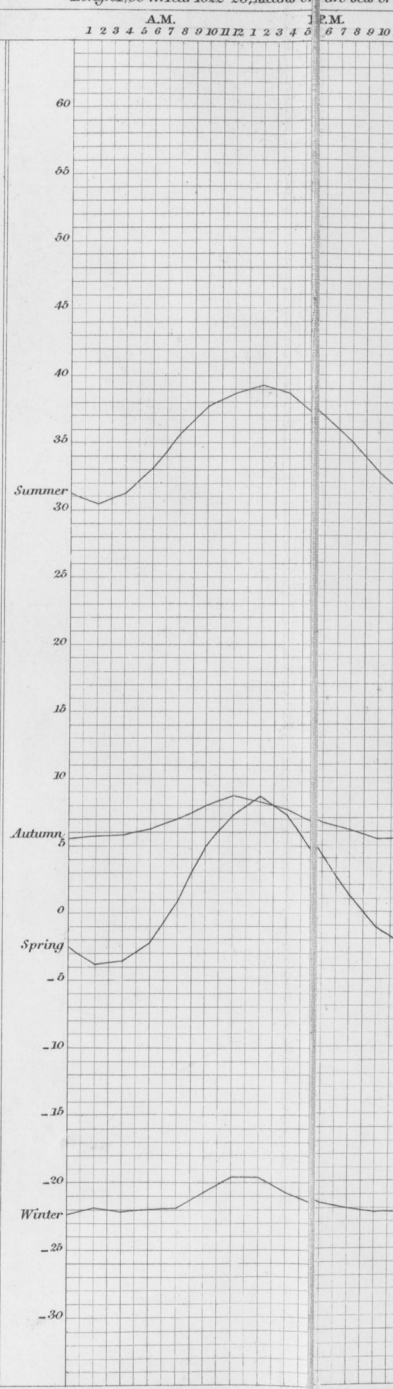


Plate 2 fig.3.

Mean daily curves for four seasons of three months each at Igloolik, Fury & Hecla Strait Lat. 69° Long. 81.53 W. Year 1822-23, Means of two sets of



June, July, Aug.st } Red
Sept.r, Oct.r, Nov.r } Yellow
Dec.r, Jan.y, Feb.y } Purple
March, April, May } Blue

Plate 2 fig. 3.

Mean daily curves for four seasons of three months each at Igloolik, Fury & Hecla Strait, Lat. 69° 20' N. Long. 81° 53' W. Year 1822-23, Means of two sets of observ.ns

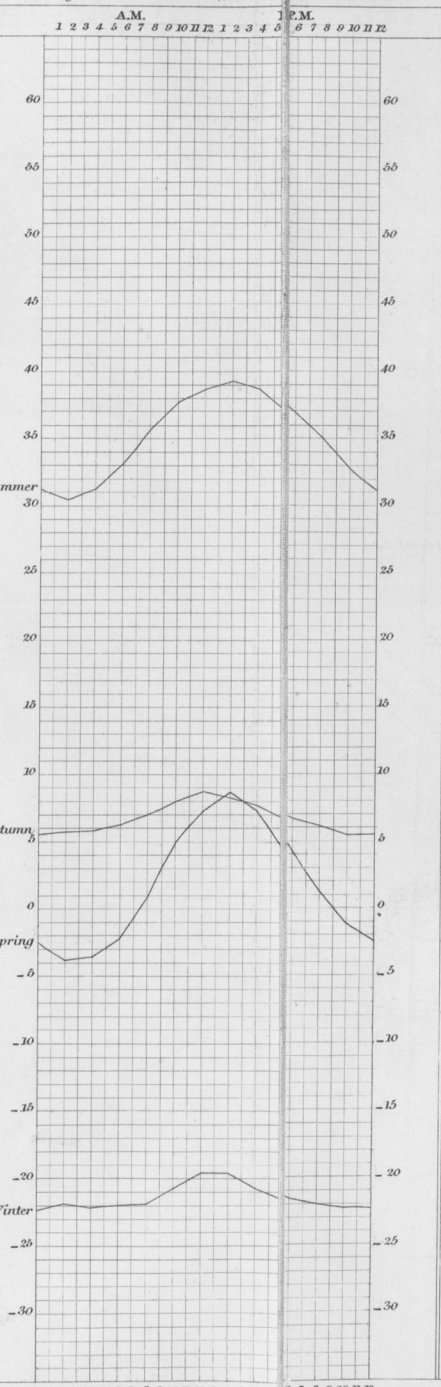


Plate 2. fig. 4.

Mean daily curves for four seasons of three months each at Winter I.d Lat. 66. 11 N. Long. 83° 11' W. Year 1821-22 Means of two sets of Observ.ns deduced from Table XXVI.

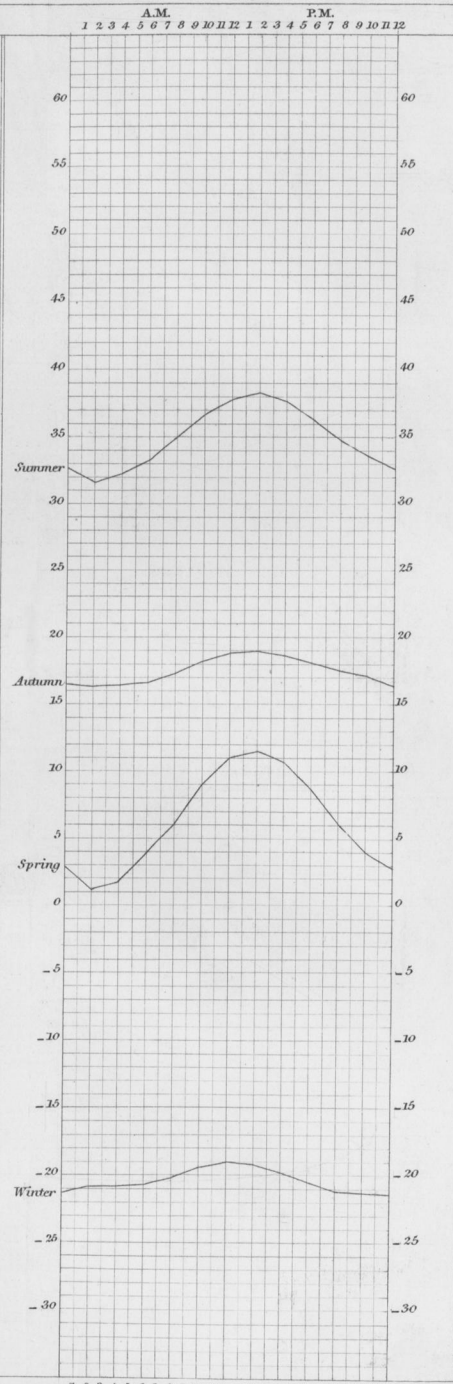
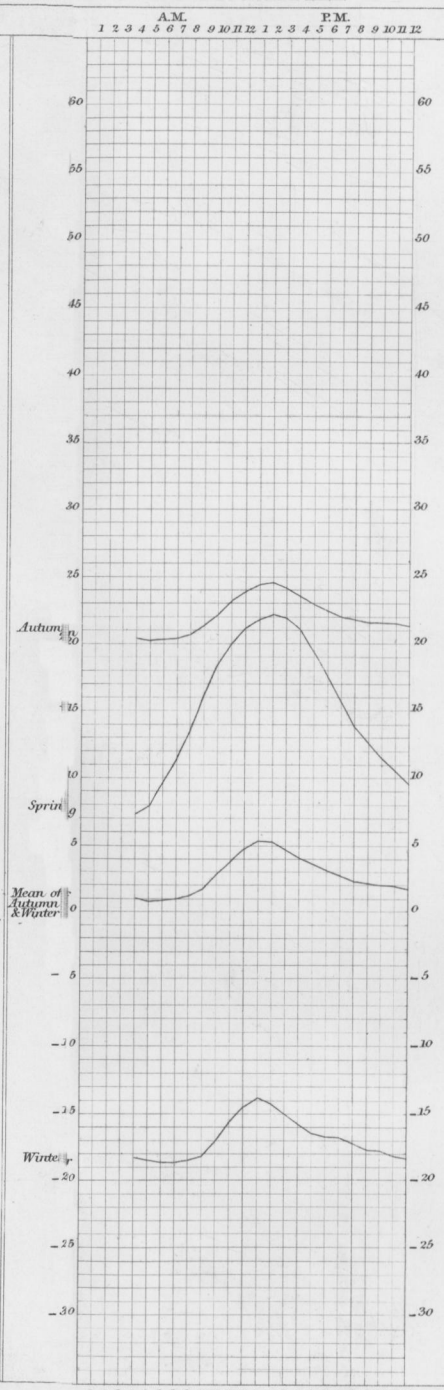


Plate 2. fig. 5.

Mean daily curves for Autumn Winter & Spring at F.t Franklin, G.t Bear Lake Lat. 65. 12 N. Long. 123° 13' W. Year 1825-26 deduced from Table XXXII.



Pub.d for the Journal of the R.t Geog.l Society by John Murray, London. 1839.

Plate 2. fig. 5.

Mean daily curves for Autumn Winter, & Spring at Fr. Franklin, Gt. Bear Lake Lat. 65. 12 N. Long. 123 13 W. Year 1825-26 deduced from Table XXXII.

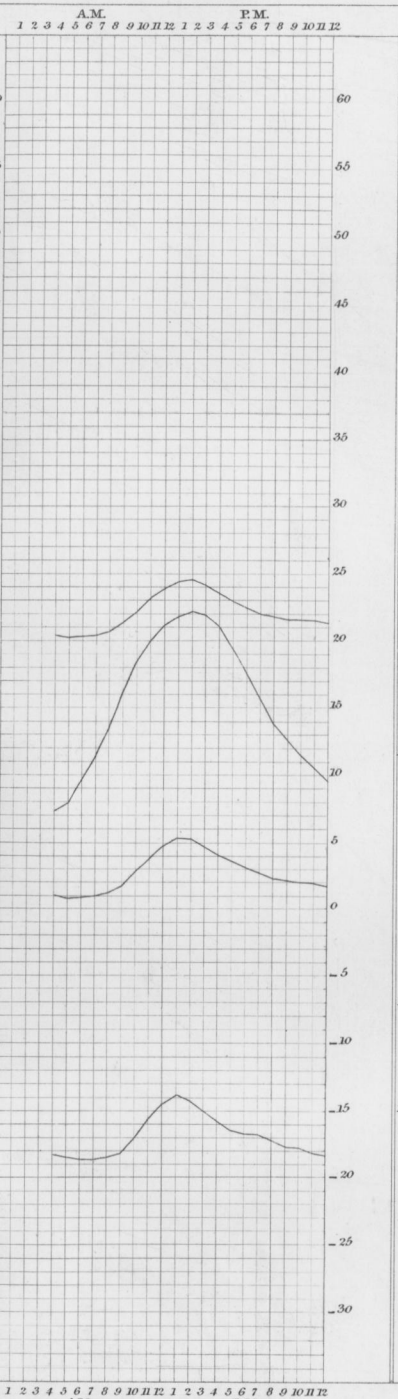


Plate 2 fig. 6.

Mean daily curves for the Summer & Winter halves of the year, in various Latitudes & years.

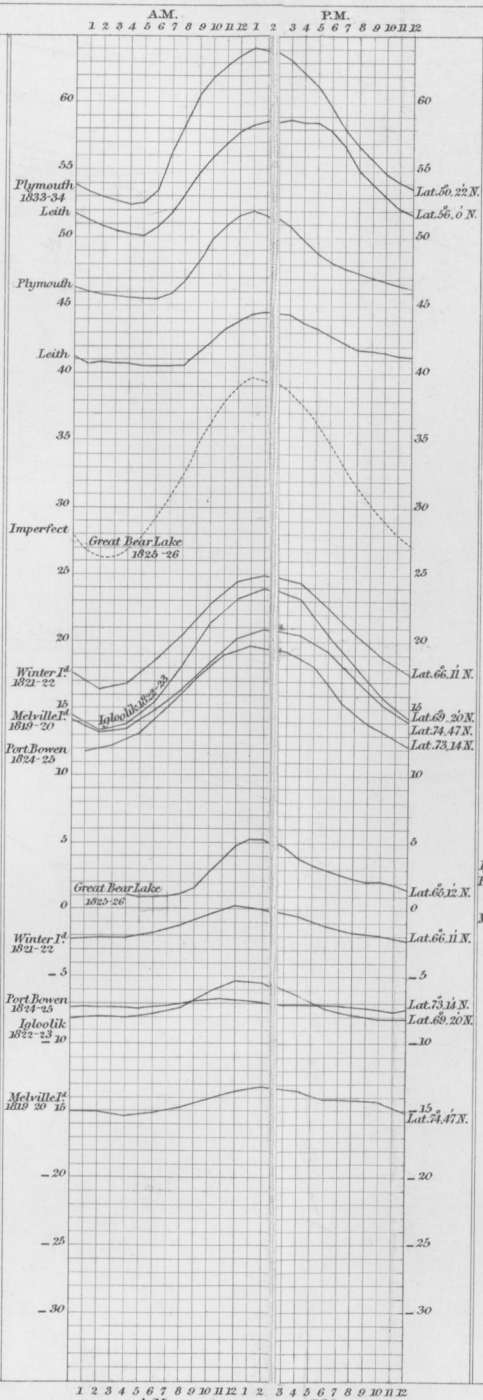
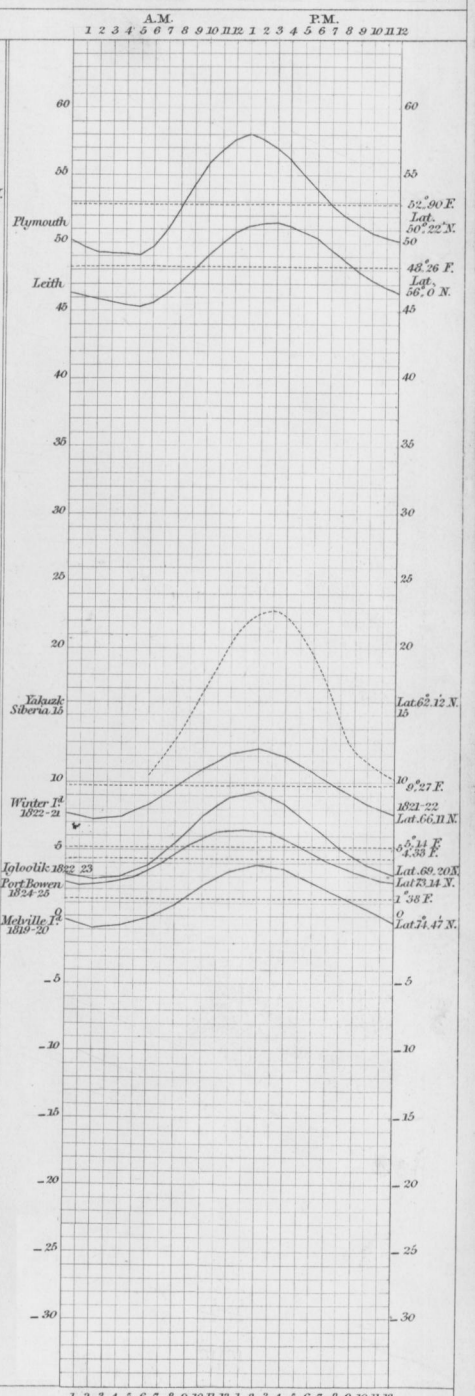


Plate 2. fig. 7.

Mean temperatures for the year & mean daily curves for various places & various years.



John Arrowsmith.